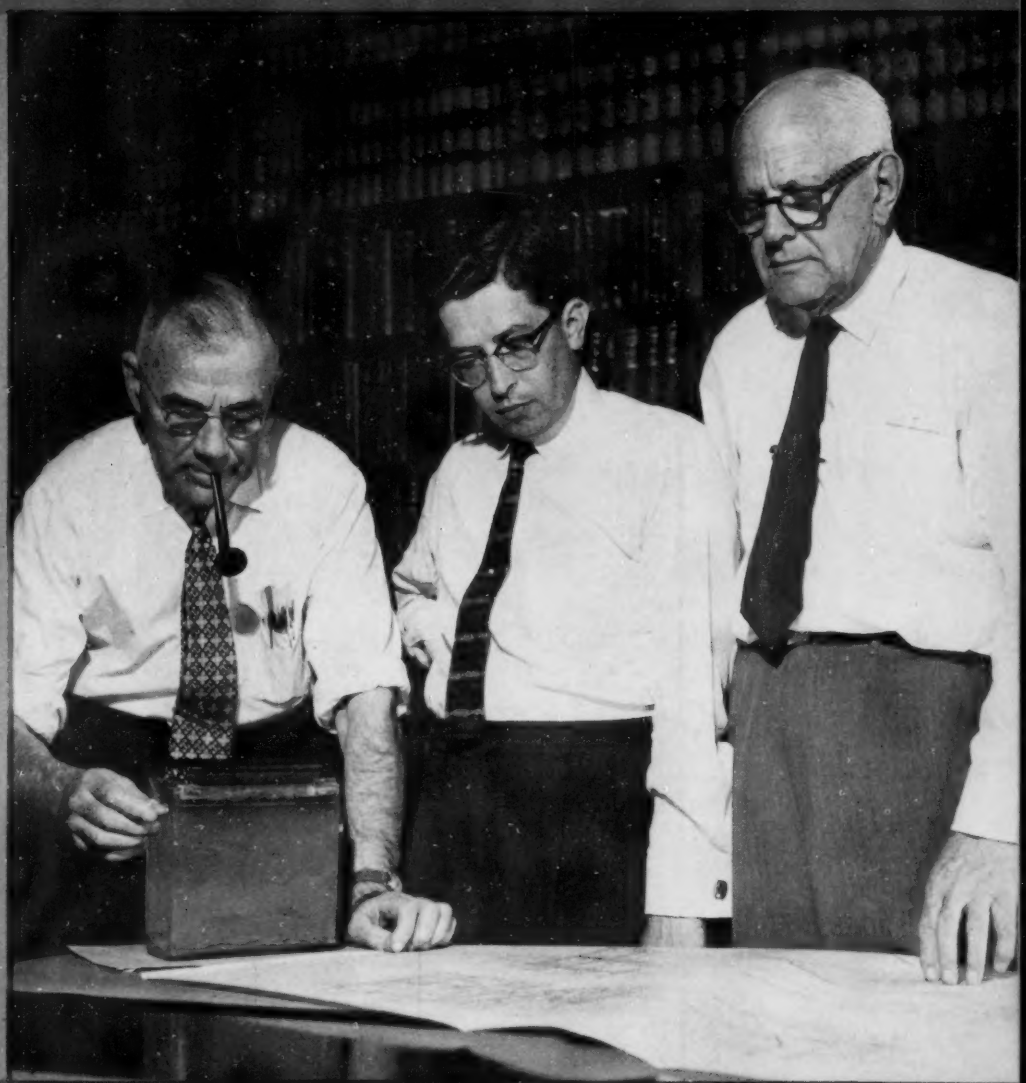
PUBLIC WORKS

Aug. 1957

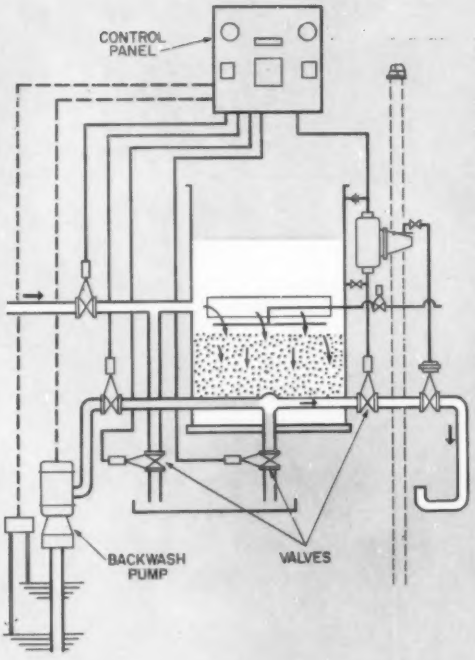
CITY, COUNTY AND STATE



Weston Gavett, Consulting Engineer of New York, at left, checks plans and discusses a model of a specially designed grit chamber with Stanley Williams, right, and James Dolan. See also page 24.

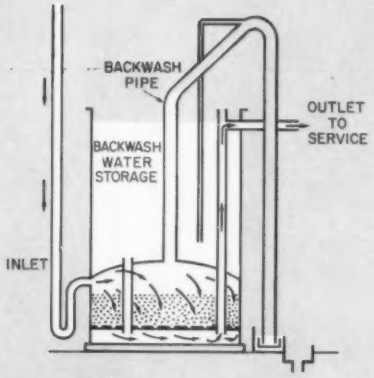
CONVENTIONAL gravity filter and hydraulic controls for automatic operation. Approximate installed cost of a unit that will filter 500,000 gallons per day:

$21,700.00



NEW PERMUTIT VALVELESS Gravity Filter. Completely automatic operation. Approximate installed cost of a 500,000 gpd unit:

$11,900.00



HOW IT WORKS: As dirt collects on the sand, increased head pressure slowly raises the water level in the large backwash pipe. See diagram. When it spills into the downward section of the pipe, it starts a siphon (backwash) flow that draws water down from the Storage area and up through the sand, "floating" dirt off to waste. When backwash water is gone, air enters the small tube and stops the siphon. Flow through the sand reverses and the first filtered water (rinse water) goes to Storage area until full. All flow then runs to Service.

New Valveless Water Filter Saves $$ for Industries, Cities, Electric Companies

• Big water users like city water departments, steam stations, refineries, chemical plants and paper mills can substantially reduce the cost of their water-conditioning equipment and its operation and maintenance . . . by adopting a new automatic Valveless Filter developed by engineers of the Permutit Company (N. Y.).

The simplified design makes ingenious use of the siphon and other hydraulic principles to replace expensive valves, flow controllers, pumps and hydraulic or pneumatic control systems. The design also prevents wasteful, excessive use of water for backwashing or rinsing. Tanks are shipped set-up to reduce installation costs. The absence of moving parts virtually eliminates maintenance costs.

The Valveless Filter produces uniform, high-quality water. It cannot be "forced." Backwashing or rinsing cannot be too little or too late . . . or accidentally run to Service. And the filter cannot develop common troubles like "cracked" or "upset" beds, "channeling" or "mudballs."

Single Valveless Filters or multiple units for any volume requirement are available. Present installations include units for industrial plants treating water for both process and drinking.

Send for free descriptive bulletin. Address: The Permutit Company, Dept. PW-8, 330 West 42nd St., New York 36, N. Y. or The Permutit Company of Canada, Ltd., Toronto 1, Ontario.

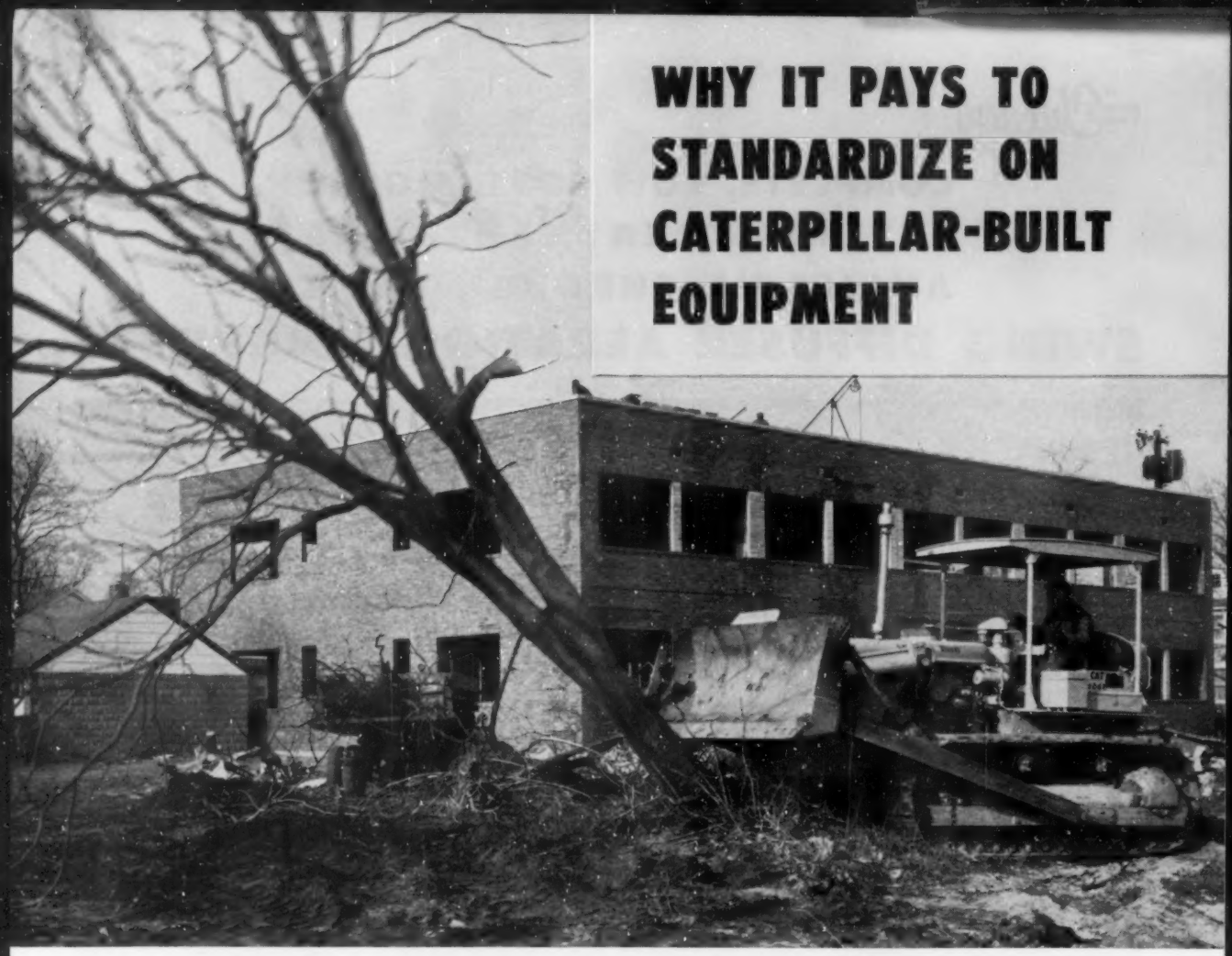
PERMUTIT®

rhymes with "compute it"

Water Conditioning

Ion Exchange • Industrial Water Treatment

WHY IT PAYS TO STANDARDIZE ON CATERPILLAR-BUILT EQUIPMENT



The Village of Valley Stream, N. Y., has a line-up of big yellow machines that includes two CAT* D6 Tractors, a D4 and a No. 212 Motor Grader. One of the D6s, equipped with a No. 6S Bulldozer, is shown here doing one of the many jobs that makes it such a useful tool. In this case it's clearing away scrub trees to build a 50-car village parking lot.

There are several reasons why it pays a municipality, large or small, to standardize on dependable earthmoving machines built by Caterpillar.

1. Operators become more efficient. They like the visibility, comfort and ease of control of Caterpillar equipment.
2. Maintenance is simplified as mechanics become familiar with one line of equipment. Lubrication schedules become routine. And many parts can be interchanged among various Cat-built machines.
3. A quarter century of diesel leadership has produced engines for all Caterpillar-built equipment that are as foolproof as engines can be made. They're built to operate on a wide range of low-cost fuels, including No. 2 furnace oil.
4. Resale value is uniformly high for Cat-built equipment . . . almost without exception, the highest in the field.

And finally, you get parts and prompt, efficient service for all your machines from one responsible source—the Caterpillar Dealer. Get full details on the advantages of standardization from him. He backs every single product he sells with reliable service and Caterpillar parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

YOUR TAXPAYERS GET THEIR MONEY'S WORTH WITH CAT-BUILT MACHINES

• • • SERVING THE PUBLIC WORKS INDUSTRY • • •

PUBLIC WORKS DIGESTS

DEPARTMENTS AND SECTIONS

BPA

Public Works T. M. Reg. U.S. Pat. Off.

Established 1896

Published Monthly by Public Works Journal Corporation. Office of Publication at Orange, Conn. Editorial and Advertising offices at 200 So. Broad St., Ridgewood, New Jersey. Subscription rates: U.S.A. and possessions, $5.00. Canada and South America, $6.00. All other countries, $7.00. Accepted as controlled circulation publication at Orange, Conn.

AUGUST 1957

PUBLIC WORKS

Vol. 88, No. 8

CLOW BELL-TITE CAST IRON PIPE

costs less to buy, less to lay!

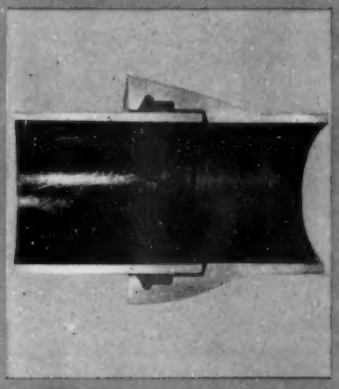
Assembly is simple. First, the joint is wiped clean.

Second step — insert gasket as shown into groove in bell.

Third — apply thin film of special lubricant to the gasket.

Next—push home the spigot, first centering plain end in bell.

No bell holes are required. Installation is very rapid.



Result—a safe, economical joint with a tight, permanent seal.

The NEW CLOW BELL-TITE cast iron pipe joint is a rubber seal joint that requires NO bolts, NO nuts, and requires NO wrenches to lay. It takes less time to install. It costs less to buy. Here's economy PLUS.

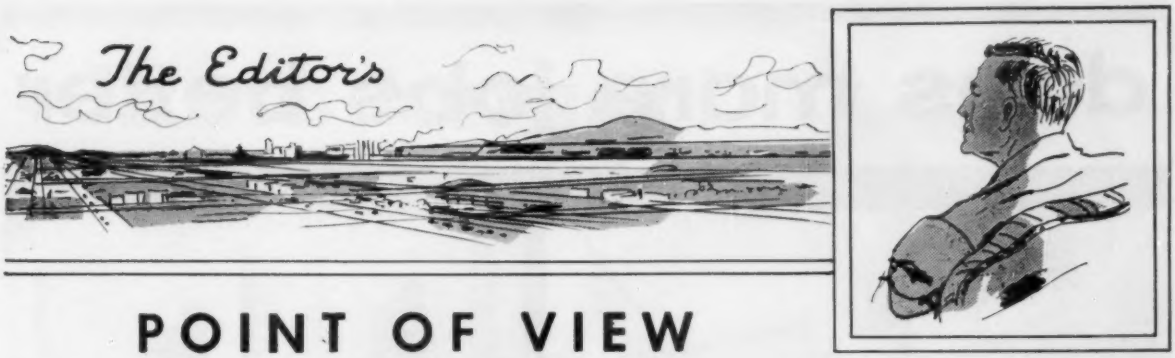
The Underwriters' Laboratories, after testing the joint, have approved its use for water working pressures up to 350 psi. CLOW BELL-TITE pipe barrel meets all quality provisions and physical requirements of all applicable ASA, AWWA, and/or Federal Specifications for cast iron pipe.

SINCE C 1878

JAMES B. CLOW & SONS, INC.

201-299 North Talman Avenue, Chicago 80, Illinois

Subsidiaries: Eddy Valve Company, Waterford, New York • Iowa Valve Company, Oskaloosa, Iowa



POINT OF VIEW

What About Billboards and Our Highways?

THERE IS QUITE a to-do about billboards and the Interstate Highway System. One has only to drive an hour through some of the New York State resort areas to get enough of billboards forever. Yet they can perform a useful purpose in informing travelers. The problem is to devise regulations that will permit useful or desirable signs of this sort without opening the gates as far as they are opened today; and if some signs should be permitted, to regulate size and shape to an unobjectionable standard. We don't think this can be done on a fair and practicable basis and for that reason we hope no billboard type sign will be permitted on our new highway system.

Where to Locate That New Office for the Water Department

WHAT PERCENTAGE OF water department customers pay their bills in person at the time-honored office in or near the center of the city? Is it ten percent? Or more? Is there any nearby place where the customers can find reasonable assurance of parking while they pay? These and other considerations prompt the question: Why not locate the water department main office in a less congested area, perhaps in the edge of the city?

We know of no city that has done this, but we do know of places where these questions are being asked, and others as well, such as the reaction of the public to the change. We will be glad to hear from any departments that have tried or thought of the change and to have them tell us their experiences.

Infiltration into Sewers Can Cost Lots of Money

INFILTRATION HAS BEEN with us almost since the first pipes were laid, but with the increasing provision of treatment plants, the problem becomes more serious and costly. There is practically no way to cure it if it occurs. Careful specifications, the use of the best materials and rigid inspection during construction are the only preventives.

In many cases, the major part of infiltration enters through the house connections, emphasizing the need for our preventive factors of specifications, good materials and strict inspection in their construction. In one study made a year or so ago, it was estimated that house connection infiltration represented about 80 percent of the total. It should be remembered that in a residential area, the footage of house sewers may be twice as great as the footage of laterals. Good construction is essential.

New methods of coping with infiltration are being developed, including a camera which photographs the interior of the sewer; the use of air pressure for estimating the porosity of the line and locating bad areas; and lining procedures. However, digging up and repairing defective lines is costly, even when the bad sections are fairly well located.

So there remains the one remedy of good specifications, the best of materials and equally good inspection.

Sewage Lagoons are Greatly Dependent on Local Conditions

LAGOONING HAS A PLACE in sewage and industrial waste treatment. How important that place is seems to depend on the viewpoint of the individual and whether and to what extent he is for or against the method. In reading our often voluminous mail on the subject, we have come to the conclusion that local conditions are important, especially in the matter of cost. One engineer writes us that, in his area, location of a site will, on the average, require the services of a survey crew for two weeks, which is no inconsiderable expense. State regulations and frequency of homes are also important, as they may determine the distance of the lagoon from the community. In areas of high-priced farm land, land purchase costs may be considerable. We think lagoons have their place, despite all the objections raised to them; but every community should have a careful study and estimate made before making a final decision.

Progress in Sanitary Landfill from Dumps

A COUPLE OF YEARS AGO, New Jersey's State Health Department put on a sort of drive to convert dumps into sanitary landfills. In 1955, the number of sanitary fills in operation more than doubled; and because in that crowded state, sites for such fills are often scarce, the number of municipalities using this method of disposal increased seven-fold. The work is continuing but because it takes a year and a half for the Department to get its annual report out, it is not possible to give up to date figures on progress. Enough data are available, however, to show that a little planned effort in this line can produce remarkable results.

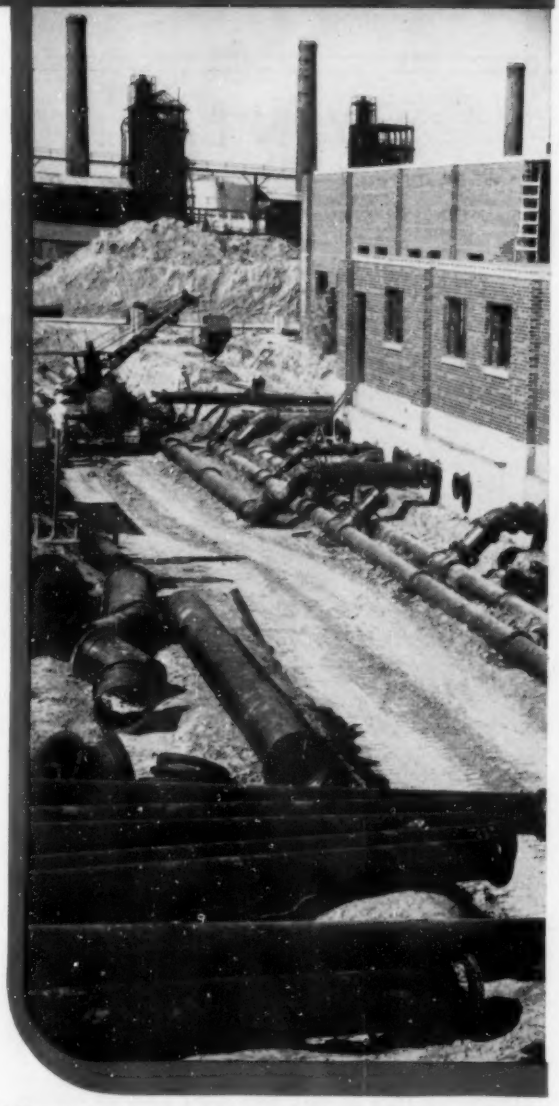
does more jobs better

Longevity, versatility—two words that describe cast iron pipe!

In *water* service, cast iron pipe is relied on coast-to-coast for fire protection, feeder and distribution mains, purification plants. In *gas* service, it's the choice for distribution and feeder lines. In *sewerage* systems, it serves in thousands of communities for force mains, outfalls, treatment plants. In *industrial* service, a wider scope yearly.

But no matter where or how it's used, cast iron pipe delivers the rugged strength whose service life is measured in centuries.

For information, write: Cast Iron Pipe Research Association, Thomas F. Wolfe, Managing Director, Suite 3440 Prudential Plaza, Chicago 1, Illinois.



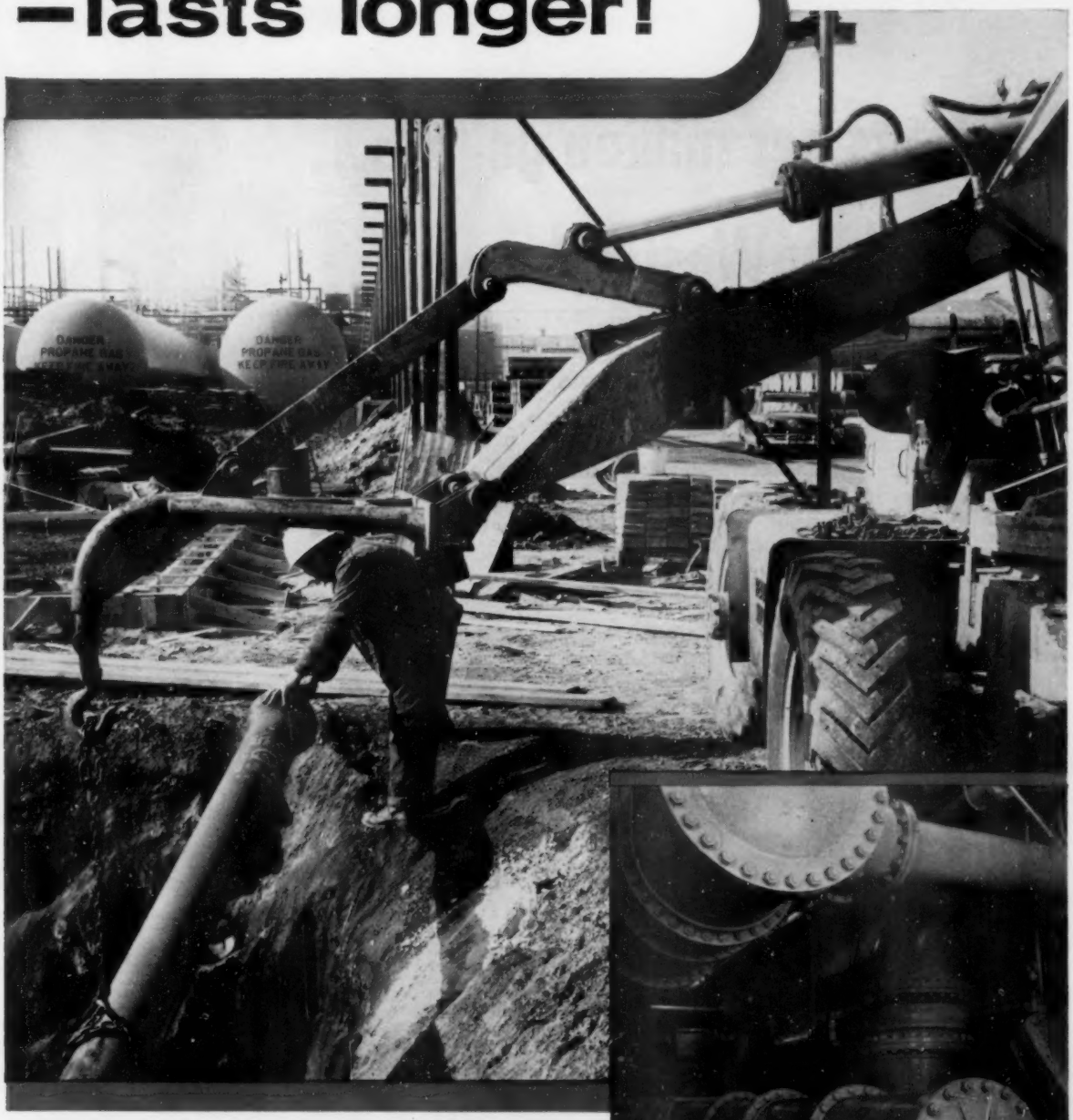
Robinson, Ill.—Mechanical Joint cast iron pipe being installed at Ohio Oil Company Refinery.

CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440 Prudential Plaza, Chicago 1, Ill.

CAST IRON PIPE

—lasts longer!



Chicago Heights, Ill.—Cast iron pipe being installed to supply water for plant of Victor Chemical Company.

International Falls, Minn.—Installation of flanged cast iron pipe and fittings in filter plant of Ontario Paper Co.

SERVES FOR CENTURIES...

78 cents per million gallons... pumped by Westinghouse

Basic operating cost of pumping stations in the Tacoma, Washington, sewage plant is of more than usual importance in the over-all plant cost because of an unusually high gallons-per-capita-day flow through the system. Engineers found it necessary to plan for nearly three times normal.

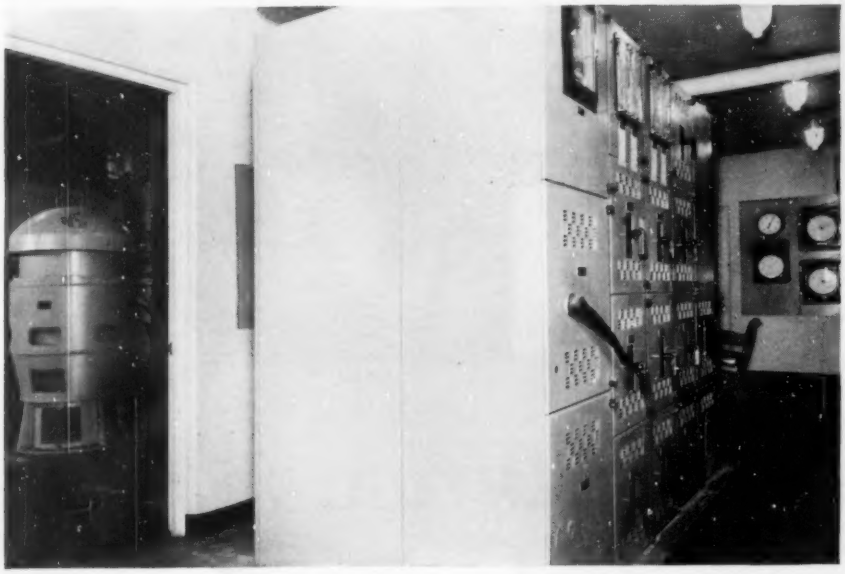
In the main pumping plant at Tacoma, four Westinghouse vertical pump motors handle the load. They are cut in and out as required and the sequence of rotation changed automatically. The station is unmanned except for periodic checks and maintenance by operators from the treatment plant.

Although the pumping requirement is high in proportion to the population served (about 67,000) the actual pumping cost is not. Yearly costs in the Tacoma plant average about 78 cents per million gallons of sewage pumped. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-94075

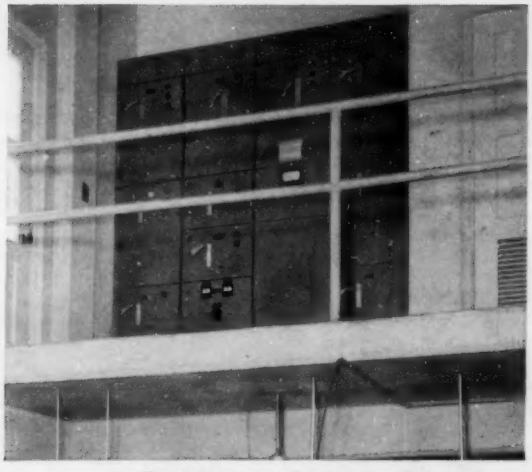
YOU CAN BE SURE... IF IT'S

Westinghouse

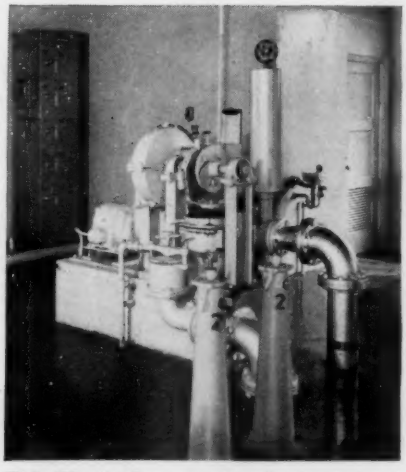
The four Westinghouse vertical pump motors in the Tacoma plant—4000 gpm, 50 hp; 8000 gpm, 100 hp; 10,000 gpm, 100 hp; 12,000 gpm, 125 hp.



Distribution of power to motor and lighting circuits for the entire plant is through this Westinghouse switchgear, located in the main pump building.



Control center for many of the sewage plant motors, located on a balcony to conserve space, is typical of the Westinghouse unitized equipment which simplifies sewage plant electrical construction.



This Westinghouse motor drives one of the many pumps in the treatment plant. Note convenient location of control unit for this and other adjacent motors.

Only International Drott gives this sanitary "seal

Here's how the Borough of Brookville, Pennsylvania, (population 4,600) uses an International Drott TD-9 Four-In-One to make certain that once refuse is put down and covered, it *stays* that way.

To "iron" down the cover, the operator simply uses the load-weighted bucket—plus hydraulic down-pressure on the compactor plate. This exclusive action gives refuse the positive, lasting "seal of approval"! It provides the properly-compacted, *uniform-depth* cover that eliminates rat-havens; does away with "mosquito hatcheries"; plugs "stench pockets," for good.

Three of the four operations shown here are essential sanitary landfill steps which only International Drott equipment can satisfactorily do. Only the International Drott Four-In-One gives "carry-type scraper" action, for example—to produce the degree of refuse and cover compaction that makes landfill *sanitary, practical,* and *low-cost!*

No wonder International Drott equipment is overwhelmingly preferred the country over for sanitary landfill duty—as actual sales figures prove!

Measure the extra efficiency your community can have with an International Drott Four-In-One—on sanitary landfill—in sand or gravel pit—on street and park duties. See what it means to get this *4-machine utility for one moderate investment.* Ask your International Drott Distributor for a Four-In-One demonstration!

Four-In-One clamshell action—obtained by a finger-tip flick of the "machine selector" lever—enables picking-up, spot-placing, or spreading refuse as desired.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

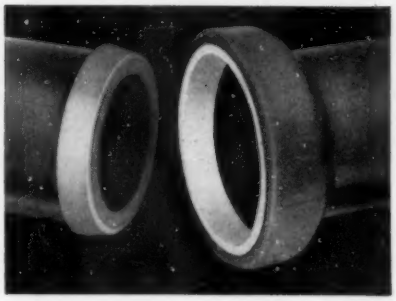
landfill method of approval"

With scraper-like action, this TD-9 Four-In-One is spreading cover dirt evenly, on the go. Positive clam-lip control permits spreading the exact depth of cover desired. Never mind rough going—exclusive Hydro-Spring swallows trouble-causing shock!

As a Skid-Shovel, using famous and exclusive International Drott pry-action break-out, the Four-In-One can obtain landfill cover dirt in minimum time. And it can give you thrifty, big-capacity *excavating* and *loading* performance on any city job!

you save money SEVEN WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint
on pipe 4 feet long or over
Available in 4" through 24" diameters



More than 200 major installations have been completed with outstanding results since Amvit Jointed Clay Pipe was introduced in 1955.

Such pioneer cities as Ann Arbor, Michigan, Dayton, Ohio, Camden, New Jersey have installed their second and third Amvit sanitary lines.

A mechanical joint designed for quick, low-cost installation, Amvit* will give you lower cost-in-place. Here's how:

1. QUICK INSTALLATION SAVES LABOR

No other materials such as caulking, joint compound, hot pots, or ladles are needed to make the Amvit joint. The joint is on the pipe delivered to the job ready for use. Just push the pipe together and the joint is complete.

2. IMMEDIATE BACKFILLING

You can backfill as soon as the line is completed. Barricades can be removed and streets opened days sooner.

3. QUICK TESTING

No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4. CONTROLS INFILTRATION

Field tests from completed installations show that infiltration can be definitely controlled. Engineers can, thus, reduce infiltration specifications, use smaller diameter pipe and save in material cost.

5. ROOT PROOF

Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in uniform compression preventing root penetration.

6. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing. Because the joint is really tight, no foreign matter such as dirt, sand and stones can possibly enter the line.

7. COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

Amvit Jointed Clay Pipe, in sizes 4" through 24" together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

SINCE 1900

AMERICAN

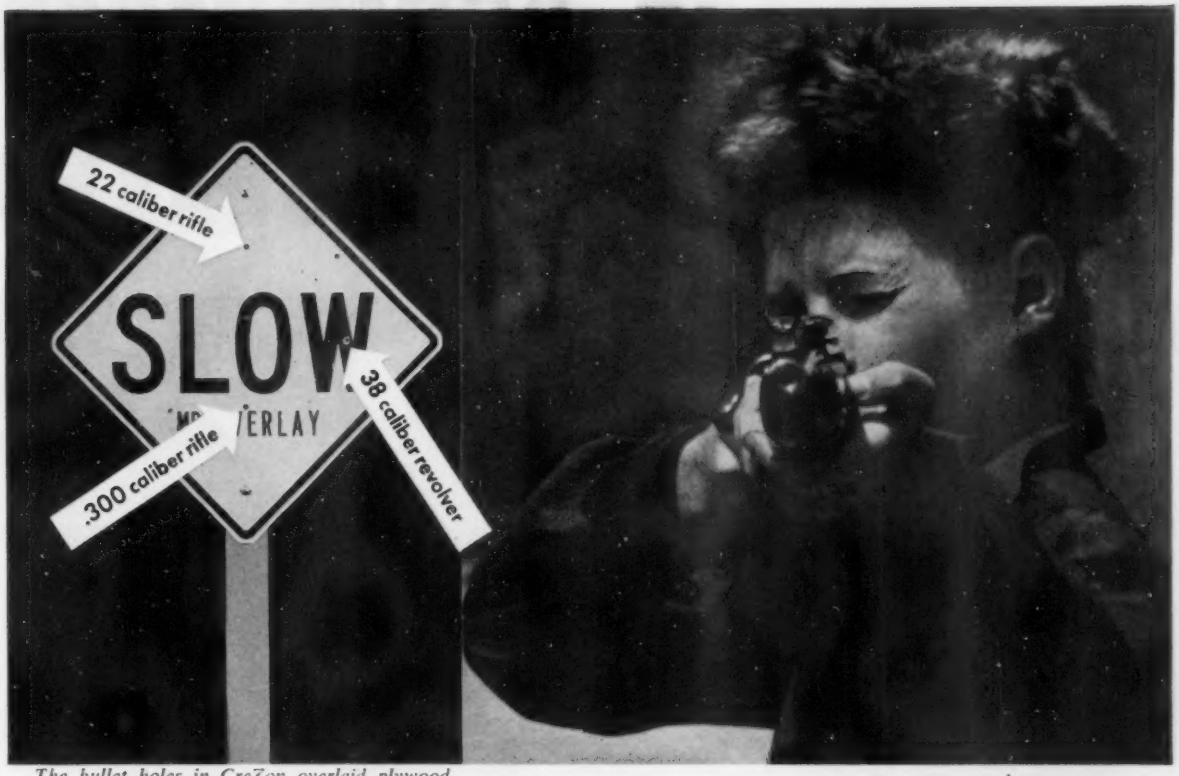
American Vitrified Products Company

CLEVELAND, OHIO

*T. M. Registered, Patents Pending

MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

Plants Across the Nation . . . Brazil, Indiana · Chicago, Illinois · Cleveland, Ohio · Crawfordsville, Indiana · Detroit, Michigan · East Liverpool, Ohio · Fenton, Michigan · Grand Ledge, Michigan · Lisbon, Ohio · Los Angeles, California · Milwaukee, Wisconsin · South Bend, Indiana · Uhrichsville, Ohio



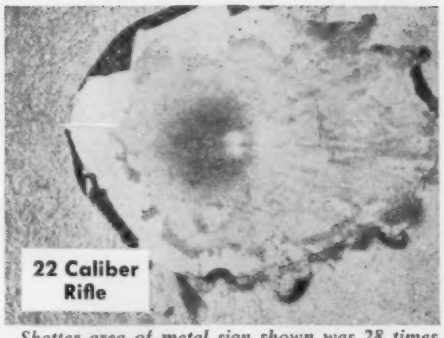
The bullet holes in CreZon overlaid plywood are scarcely visible, tend to seal themselves.

A SIGN THAT REFUSES TO SAY "I'M DEAD"

● To frustrate the "sign hunters", more and more highway sign users are adopting CreZon overlaid plywood signs. These new-type signs don't resound, don't show gaping holes. And the bullet holes remain small, even tend to fill in, thus sealing themselves.

Weather tests prove that CreZon plywood signs have an actual life expectancy of up to 15 years. The material is strong and rigid; resists bending or tearing loose from pole. There's neither checking nor blistering from heat or freezes. And water won't seep in behind its weather-proof surface.

CreZon plywood is easy to work, too. Its velvet-smooth tooth takes paint extremely well, assures greater visibility, higher gloss. You cut costs in many ways with this ideal sign material.



Shatter area of metal sign shown was 28 times larger than in CreZon plywood also struck by a 22 calibre bullet.

CreZon plywood is available through these plywood manufacturers and their distributors. Consult your Yellow Pages for company nearest you or write Dept. CR, Crown Zellerbach, 343 Sansome St., San Francisco 19, California.

Diamond Lumber Company
Portland, Oregon

Georgia Pacific Corp.
Portland, Oregon

Edward Hines Lumber Co.
Chicago 2, Illinois

Mount Baker Plywood, Inc.
Bellingham, Washington

Roseburg Lumber Company
Roseburg, Oregon

St. Paul & Tacoma Lumber Co.
Tacoma, Washington

United States Plywood Corp.
New York 36, New York

Walton Plywood Company
Everett, Washington

Also available in Canada through:

Canadian Western Lumber Co.
New Westminster, B. C.

MacMillan & Bloedel, Ltd.
Vancouver 1, B. C.

Western Plywood Co., Ltd.
Vancouver 15, B. C.

The permanent protective overlay for plywood.

CreZon®

Another quality product by

CROWN ZELLERBACH
SAN FRANCISCO 19, CALIFORNIA

IT SEEMS MOST

NEW ROCKWELL SEALED

EVERYONE WANTS REGISTER WATER METERS

From North, South, East and West . . .
The Response Has Been Terrific!

When a few months ago, we introduced the Rockwell Sealed Register Water Meter, *we* knew we had something good. But your tremendous acceptance and response to this new idea in metering has exceeded our fondest hopes.

Surprisingly enough, this business has come from *all sections* of the country . . . from areas where fogged registers or corrosion are normally not problems . . . and from towns, cities and water companies all over the United States.

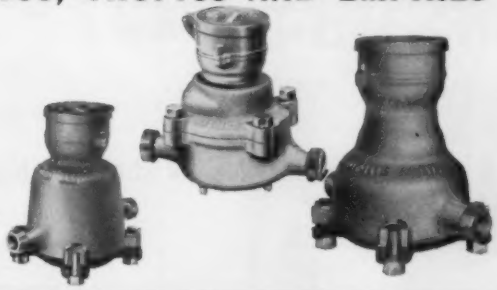
This is all very gratifying. It again proves that water works men *welcome change* when it means *betterment* . . . when a product such as the Rockwell Sealed Register Meter promises to make measurement more accurate, less troublesome and less costly.

Our thanks to all who have ordered these remarkable new meters. Production is being increased as rapidly as possible, but there will be unavoidable delays in filling everyone's needs. One thing is sure—production *will not* be rushed at the sacrifice of quality. Every meter shipped will be carefully made, inspected and tested. So please be patient. Rockwell Sealed Register Water Meters are well worth waiting for.

To the farsighted, we advise your anticipating next year's first quarter requirements for these new and better meters—now! *Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.*

PROMPT DELIVERY ON ARCTICS, TROPICS AND EMPIRES

In spite of the tremendous acceptance of the Rockwell Sealed Register Water Meter, we will continue to make and sell our standard lines of domestic meters. These meters are produced in separate facilities so prompt shipments can be made—usually from warehouse stocks.



Harborite street stencils as used by Department of Traffic, City of Los Angeles

another city discovers Harborite

Harborite overlaid fir plywood...the perfect material for street stencils!

What a wonderful discovery for street stencils. Solid fir plywood with a hard, smooth, plastic-like overlaid face that resists wear and water... hides grain... eliminates checking... makes it possible to scrape off paint repeatedly without splintering the wood... cuts out easily and cleanly because the overlay resists edge splintering ... lightweight... easy to handle... and costs far less because it lasts far longer... up to six months use reported and panels still in excellent shape. Next time specify Harborite!

Harborite is ideal for street and highway signs, too!

HARBOR
PLYWOOD CORPORATION
Aberdeen, Washington

WRITE FOR MORE INFORMATION ON HARBORITE • *Harbor Plywood Corporation, Dept. 12, Aberdeen, Washington*

...before you specify

any sign material

discover the advantages of

HARBORITE®

the miracle overlaid fir plywood super-resistant to wear, weather and water

Everything you want in sign material—easy handling...easy painting...durability...economy—is right here in Harborite, Super-Grade or Special. Its super-tough, resin-impregnated overlay ignores wear and weather, and provides a wonderfully-smooth, grainless painting surface! Looks better far longer!

★ *Waterproof* ★ *Won't split*
★ *Won't check* ★ *Won't rust*
★ *Tremendous strength*
★ *Less framing needed*
★ *Lightweight* ★ *Repeated re-uses*
★ *Choice of thicknesses*
★ *Resists Vandalism*

NOW IN TWO GRADES TO MEET YOUR REQUIREMENTS!

Super-Grade: The original overlaid plywood with overlays on both sides...Excellent for street and highway signs, cut-outs, letters, all jobs requiring a solid wood core.

Special: New low cost grade! Same super-resistant overlay on a solid face, with special purpose core. Perfect for large panels fastened to framing.

tests prove Harborite superior to steel, aluminum and fiberglass

Send for test booklet

HARBOR PLYWOOD CORPORATION
Aberdeen, Washington SPW

SEND ME:

☐ Douglas Fir Plywood Association test booklet.

☐ Harborite sample and additional information.

NAME_____

ADDRESS_____

CITY_____ ZONE__ STATE_____

FIRM NAME_____

HARBOR
PLYWOOD CORPORATION
Aberdeen, Washington

Protect YOUR

USE MUELLER® COPPER

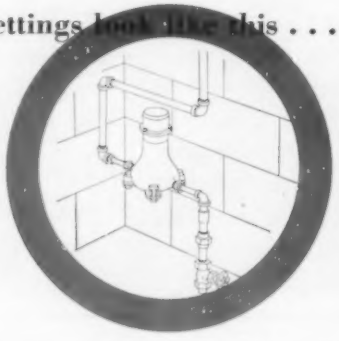
Mueller Copper Meter Yokes give strong, permanent settings for your water meters quickly and easily. Installation time is reduced to a minimum and fittings are practically eliminated.

Ribbed body absorbs piping stresses without transmitting them to the meter. Meters are protected to insure accurate measurement and full revenue.

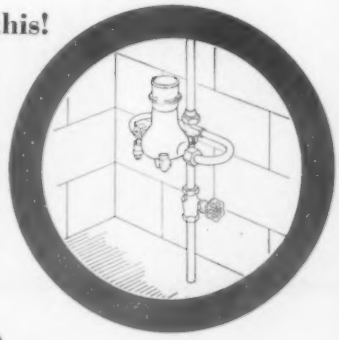
Properly spaced and aligned swivel nuts make meter changes for testing and maintenance a cinch. Pipes are not disturbed and replacement is fast and easy. Swivel nuts are drilled for wire seal, too.

And Mueller's special, multi-purpose end connections give you a choice of outside I.P., inside I.P., copper or any combination of these connections just by changing tailpieces.

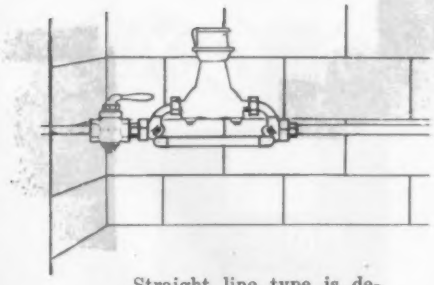
If your meter settings look like this . . . . . try this!



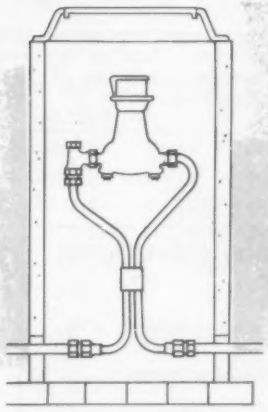
Save time, fittings and pipe in basement meter settings by installing a Mueller Copper Meter Yoke specifically designed for basement settings. A tailor-made setting for your meter at right angles to the service line is quickly completed.



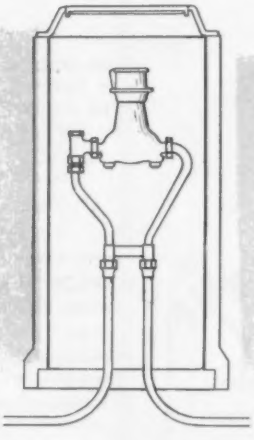
a* COPPER *Meter Yoke for any installation!



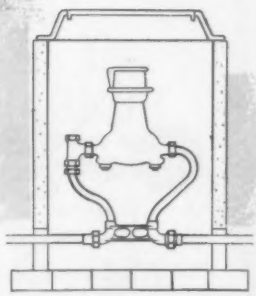
Straight line type is designed for indoor settings where meter cannot be raised or for outdoor use with shallow lines.



Flexible inlet and outlet of this yoke make it easy to install where pipes are out of line and connections are difficult to make. Also available for pipes at different levels, for angle settings or extended for connections outside of box.



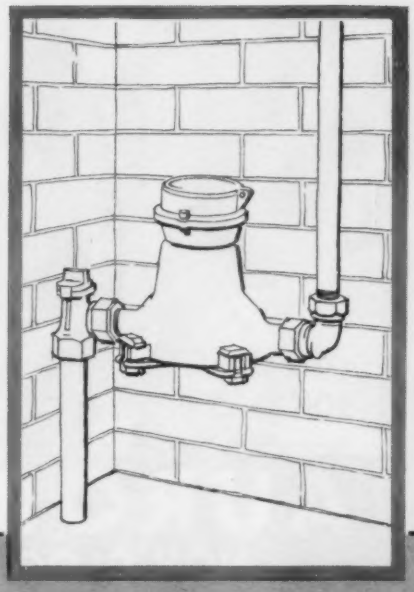
Vertical inlet and outlet type makes it possible to use regular outdoor meter box for deeply-buried lines.



Horizontal inlet and outlet type is used for outdoor meter box settings where service line is buried at medium depth.

WATER METERS...

METER YOKES!



And if you cannot use a meter yoke . . . use a **MUELLER** *Angle Meter Stop!*

An ideal setting for extremely confined locations where there is not enough space for a yoke or stop, is a Mueller Angle Meter Stop and Meter Coupling. Setting is made quickly and no other fittings are needed.

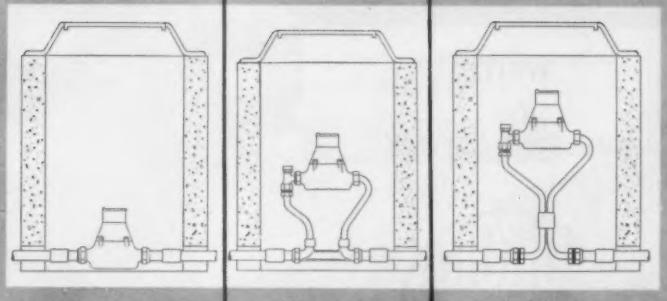
Install Copper Meter Yokes in your existing services without changing piping or fittings!

Mueller Copper Meter Relocater Yokes are easily installed in place of present meters without disturbing original fittings or piping in any way.

Yoke body is the same length as meter and inlet and outlet connections have standard meter spud threads. Meter is raised above dirt and water in meter box and made much easier to read or change. And flat head or lock wing stop may be included right in the yoke.

Flexible Copper Meter Relocaters make it easy to raise meters even when pipe has shifted out of line or moved closer together or farther apart. The flexibility of the connections is not transmitted to the upper portion of the yoke and spacing for meter is unaffected.

. . . see your Mueller Representative today!



Original installation | Relocater Yoke | Flexible Relocater

Since 1857

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Here's why the OTTAWA BACKHOE was chosen for the Mount Joy, Pennsylvania sewer job

The A. R. Palombo Construction Company of Pittsburgh, Pennsylvania, chose the Ottawa Backhoe for their Mount Joy, Pennsylvania job, to dig 40,000 ft. of trench for 6" and 8" lateral sewer lines, many of which were 11 ft. deep.

The Ottawa patented ejector bucket, which positively ejects wet, sticky material, made it possible for them to work through all kinds of weather to complete the job. There was no costly delay due to shaking, slamming or hand cleaning, as required with buckets which do not have the automatic ejector feature.

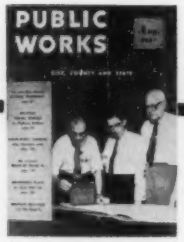
Mr. A. R. Palombo stated, "We are also using two Ottawa Backhoes on our Bethel Boro sewage job, for several reasons. It has a powerful hydraulic action, and the two-lever control makes it easy for the operator to work in close quarters." Tight areas, trees, low wires and heavy traffic which interfere with production when using large cable type diggers are no problem with the Ottawa Backhoe.

For more information on how you can save money by using the Ottawa Backhoe with patented dual One-Trols and automatic ejector bucket, write to

OTTAWA STEEL DIVISION
L. A. Young Spring and Wire Corporation
OTTAWA, KANSAS

ANOTHER LAYGO PRODUCT

Ottawa



LEADERS IN PUBLIC WORKS

Weston Gavett, shown at the left on our front cover, is an active partner in Clyde Potts Associates, consulting hydraulic and sanitary engineers, New York City. His partner, **Stanley Williams,** is at the right; with **James A. Dolan,** one of the top staff of the firm, in the center. The three are shown operating a model of a special grit chamber which is provided with spiral circulation obtained from the use of surface paddles. This device is one of Mr. Gavett's "Rube Goldbergs" which, in turn, represent one of his principal hobbies.

A graduate of Cornell University with degrees of CE in 1911 and MCE in 1912, he worked for the late George Fuller for a time and also was employed in the field of water treatment before becoming one of the World War I Sanitary Corps officers, serving with the AEF. Upon his return from France in 1919, he went with Clyde Potts and has been in the consulting field ever since. Under his direction, his firm has handled many water and sewage treatment projects, some of them of special interest. As far back as 1922-23, he utilized digester gas for powering gas engine driven blowers and the engine exhaust heat for facilitating sludge digestion. In 1937-38, he designed and operated a high rate trickling filter pilot plant at Englewood, N. J. He has contributed technical papers and discussions to many journals. He is a member of such technical societies as AWWA, NEWWA, APHA and ACS.

Mr. Gavett lives in Plainfield, N. J., the town where he was born. He and Mrs. Gavett have three daughters, all married, and six grandchildren.

CARTER CIRCULAR COLLECTORS

rugged design... accurate manufacture...

A true picture of **DEPENDABILITY**

Carter Circular Collectors are unequalled for positive and continuous removal of solids and sludges over a wide range of withdrawal rates. Expert design and careful stress analysis of scraper trusses . . . preassembly and match-marking of members . . . all add up to swift, accurate erection in the field, and smooth troublefree performance in the plant. In operation, controlled propulsion of the scraper truss guarantees effective movement and concentration of settled material from the full radius of the tank . . . maintaining sludge withdrawal at a completely uniform rate.

In plants of all sizes . . . including applications in the treatment of water, sewage and industrial wastes . . . Carter Circular Collectors are constantly adding to a reputation for complete dependability — regardless of how tough the clarification job may be.

Write today for Bulletin 4906

RALPH B. CARTER COMPANY
210 ATLANTIC STREET, HACKENSACK, NEW JERSEY

—a season of operation *with* NO TIME OUT FOR REPAIR

That's the record made in Appleton, Wisconsin, last winter by the Fox Mountable Spreader pictured above. This great record of continuous operation was made possible largely because of the *Fox Auger Feeder.*

Because the Fox Auger Feeder completely eliminates troublesome conveyor chains and drag bars, it also does away with the highway equipment maintenance man's greatest headache—*breakdowns.* And, because of its positive, even, powerful action, the Feeder insures a steady flow of material to the distributor or spinner. The spinner, which makes operation possible in traffic without damaging passing vehicles, can be easily and quickly adjusted to provide a spread ranging from 8 feet to 32 feet.

Only one man operates the Fox—The Control Lever that starts and stops flow of material is easily operated by the driver . . . operates effectively at speeds ranging from 5 to 40 miles an hour. You don't need to slow down to stop flow of sanding material.

With the Fox you make use of trucks you already have — can be mounted and ready to operate in 15 minutes. Here's how simply it's done.

1. When not in use, Fox Spreader is stored on a wheeled "dolly."
2. Push "dolly" out under loading crane or hoist—attach lifting yoke to "eyes" which are a part of frame. Hoist and drop in place on truck body.
3. Lock adjustable shafts to tail gate—anchor to sides with built-in hand crank tie rods.
4. Give Wisconsin air-cooled engine a few turns to check—and you're ready to go. It's as simple as that.

Conceived by Practical Maintenance Men—The Fox Mountable sand, chip, salt, calcium chloride spreader is engineered and manufactured by men with 38 years experience building heavy-duty equipment. For more information, prices and complete specifications, see your road machinery dealer. If a dealer has not been appointed in your locality, write, wire or phone collect to *Fox River Tractor Co.,* P.O. Box 469, Appleton, Wisconsin. Phone: Regent 4-1451.

FOR MORE DETAILS ➡

FOX RIVER TRACTOR CO.
APPLETON, WISCONSIN

Fox River Tractor Co., Appleton, Wisconsin

I'm interested in making a substantial saving in our sanding operations. Please send complete literature specifications, and prices on the new Fox Spreader. Dept. R3.

Name_____

Position_____

Address_____

City_____ State_____

saves time

More lengths laid per man hour...
more elbow room on your estimates when you use "Tyton Joint" pipe.

Even more important, this new joint is as dependable as it is fast. A specially designed rubber gasket...only accessory needed ...fits into the bell of the receiving pipe. The inserted pipe slides in easily, compresses the gasket and makes a bottle-tight permanent joint.

No bell holes. No weather worries... "Tyton Joint" can be laid in a wet trench or rain. And so easily even a green crew becomes expert quickly.

For more speed, simplicity, dependability in pipe laying—all along the line—get the facts on "Tyton Joint." Call or write today.

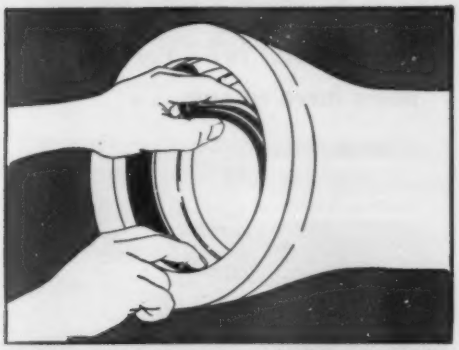
U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE

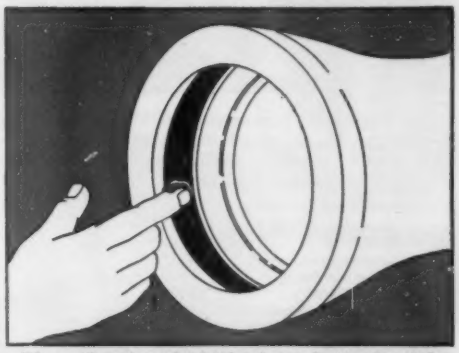
INDUSTRIAL SERVICE CAST IRON

U. S. **TYTON** JOINT

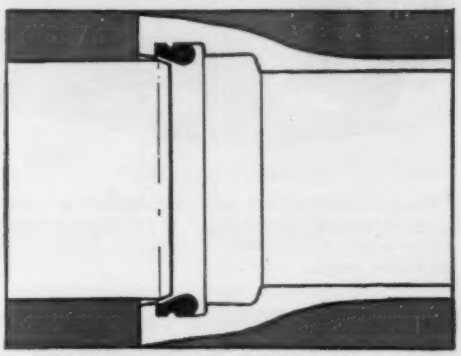
ONLY FOUR SIMPLE ACTIONS



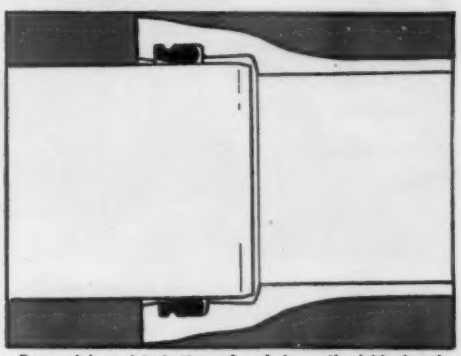
Insert gasket with groove over bead in gasket seat



Wipe a film of special lubricant over inside of gasket



Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket . . . the job's done!

The Big Fleets buy

Here's what 1957 Ford truck users have to say . . .

Ford F-100 pickup owned by Yolo County Highway Department, Woodland, Cal.

"Our new Ford pickups are providing dependable, low-cost transportation for our foremen and mechanics who are on the go all the time over rough, hot country," says Emery F. Dodson, purchasing agent.

Ford F-750 refuse collection truck owned by the city of River Oaks, Texas.

"Ford trucks get the job done best. They are the most economical and downtime is at a minimum compared with other vehicles I've used," reports W. F. Harrison, director of public works.

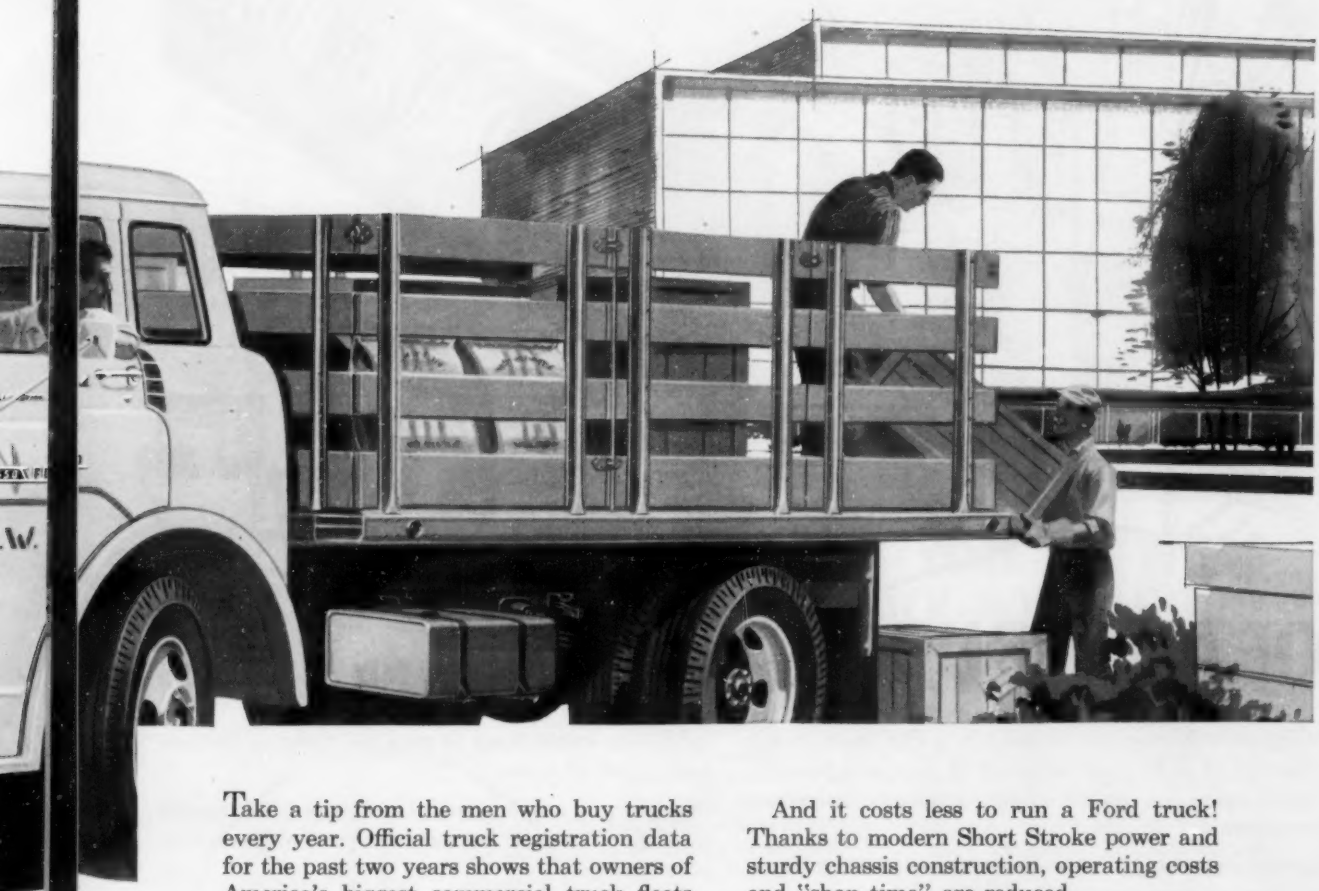
Ford F-750 Heavy-Duty dump truck owned by Westchester County, Valhalla, New York.

"We spend millions of dollars a year on public projects and are conscious of dollar values. As far as trucks are concerned, Ford gives us top dollar value," says Wilbur F. Curran, purchasing agent.

Ford's Tilt/Cab Models are big in power, in capacity . . . up to 212 hp. Six series provide GVW's from 18,000 lb. to 30,000 lb., GCW's to 60,000 lb.

Why? . . . because on-the-job performance and low operating costs prove FORD trucks cost less!

more FORD TRUCKS than any other make!



Take a tip from the men who buy trucks every year. Official truck registration data for the past two years shows that owners of America's biggest commercial truck fleets have bought more Ford trucks than any other make!

Municipalities, large and small, have found Ford trucks are best for their fleets. To begin with, Ford's initial costs are low. Many models are priced below all competitive makes. For example, the new Ford Tilt/Cab models are America's lowest-priced!*

And it costs less to run a Ford truck! Thanks to modern Short Stroke power and sturdy chassis construction, operating costs and "shop time" are reduced.

Another important plus you get when you buy a Ford is longer truck life—a fact certified by independent insurance experts for the twelfth consecutive year.

Add it all up—you'll find Ford trucks do cost less! Contact your Ford dealer . . . let him show you why the big fleets are buying more Ford trucks than any other make.

Based on comparison of manufacturers' suggested retail prices

FORD TRUCKS COST LESS

LESS TO OWN — LESS TO RUN — LAST LONGER, TOO!

ROOT-PROOF JOINTS

ORANGEBURG® *Root-Proof* PIPE AND FITTINGS

Independent investigation of Orangeburg Pipe sewer lines, in service up to 50 years, shows that its Taperweld Joints® remain tight . . . against leakage, infiltration, and root penetration.

Orangeburg's record in actual use has earned its recognition as a standard house sewer pipe by leading approving authorities from coast to coast.

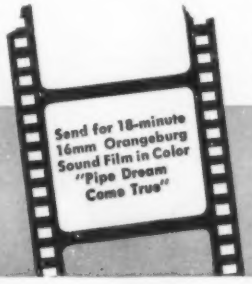
OVER 250,000,000 FEET IN SERVICE!

Orangeburg Pipe delivers dependable service because it is strong and resilient . . . withstands temperature changes and traffic tensions . . . resists acids and alkalies in ground waters and sewage wastes. Lines 50 years old, operating like new today, prove its durability.

Orangeburg is easy to install. Lightweight 8-foot lengths handle fast. Taperweld Joints seal root-proof without cement or compounds.

Orangeburg Root-Proof Pipe is for sewer lines from house to street main or septic tank; for downspout run-off lines; storm drains; other non-pressure underground outside lines. Orangeburg also comes *Perforated* for foundation drains, septic tank disposal fields . . . draining wet spots.

For summary of "Report On Investigation of Orangeburg Pipe For Sewers" by a prominent sanitary engineer write Dept. PW-87



ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, N. Y. NEWARK, CALIF.

ORANGEBURG ROOT-PROOF FITTINGS

EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Air Lift Pump Units For Low Lift Pumping

340. Air lift pumps for low lifts in sewage and water treatment plants are described in Bulletin 22S7548 available from Walker Process Equipment Inc., P. O. Box 266, Aurora, Ill. Complete details with drawings, selection charts and application formulas; as well as curves showing capacities and operating characteristics are covered. Check the reply card.

Why and How To Use Pneumatic Tired Rollers

345. The why and how of pneumatic tired rollers on base and surface courses, sealing completed fills, surface treatments, floated surfaces, hot and cold asphalts and stabilized soils are covered in Bulletin 10 from Tampo Mfg. Co., San Antonio, Tex. For information on operating conditions and compaction charts check the reply card.

Bridge Concreting, Its Problems and Solutions

390. A 16-page catalog illustrating the concreting problems involved in bridge construction is available from The Master Builders Co., Cleveland 3, Ohio. The catalog covers concreting of piers and bridge decks for highway and railway bridges, and includes discussion of hot and cold weather concreting, the use of lightweight aggregate in bridge work; and placing and finishing problems encountered in bridge work. Check the reply card for Catalog MBR-P-11.

Swimming Pool Pumps

366. This bulletin contains information on swimming pool pumps that are adapted to all types of pool filtering and vacuum cleaning systems both private and commercial. Check the reply card or write Marlow Pumps, Div. of Bell & Gossett Co., Midland Park, N. J., for detailed specifications.

Flexible Bucket Machine Catalog

386. Sewer cleaning bucket machines with the automatic bucket dumper and the safety booster clutch are described in Catalog No. 57-Z available from Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif. Specifications, features, models, operation and attachments are covered. Check the reply card today.

Centralized, Supervisory Control for Widespread Operations

392. The centralized, economical control of widespread, remote operations as accomplished by the Synchro-Scan Supervisory control system, is described in a 12-page color bulletin. The system remotely controls operation of any combination of pumps, valves, gates and similar devices. Check the reply card or, write Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I., for Bulletin 240-P2A.

Utility Compartments and Utility Bodies For Pick-Up Trucks

329. Newly designed pick-up truck side compartments which mount easily on the sides of pick-up truck boxes by removing the fenders are described in literature from Auto Body Works, Inc., South Pierce Ave., Appleton, Wisc. Maintenance and water personnel should check the reply card for this information.

International 6-Cylinder Carbureted Power Units

398. A graphically-illustrated 12-page catalog CR-511-G, on IHC 6 new 6-cylinder power units is available. Power and fuel consumption curves and cutaway views of component parts of the units are covered. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., for specifications.

Wedge-Lock Plastic Joint For Clay Pipe

401. A bulletin on Wedge-Lock clay pipe has been published by the Robinson Clay Product Co., 65 West State St., Akron 9, Ohio. Completely illustrated, this bulletin offers complete information on vitrified clay pipe and the simple installation of the plastic joint. Check the reply card.

Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Check the reply card today.

Foxboro Teletax Telemeter System

430. The Foxboro Teletax is a long-distance transmitter-receiver system which provides a continuous record on a permanent chart and is of the impulse-duration type. Any method of transmission may be used. Check the reply card or write The Foxboro Co., Foxboro, Mass. for full information.

Motor-Driven Controlled Volume Pumps

489. Bulletin No. 553-1 describing a complete line of motor-driven controlled volume pumps is available from Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia 18, Pa. It contains complete specifications, latest design features and applications. Check the reply card.

Irrigation Systems For Parks and Golf Courses

433. A 12-page illustrated bulletin to assist park and golf course officials in planning irrigation systems is available from Triangle Conduit and Cable Co., Inc., New Brunswick, N. J. Check the reply card for information on reasons for irrigation; types of pipe available; irrigation considerations including sources of water etc.

4-Wheel Drive Tractor Loaders

434. A 16-page Catalog, No. 1033-5-57, describing the "Tracto-Loader Line" of front end wheel loaders is available from Tractomotive Corp., Deerfield, Ill. Covered are the five models that are in production. Check the reply card.

Spreader For Salt and Aggregate Spreading

451. This spreader that is easy to hook-up and adjust is designed for spreading sand, cinders and salt in ice control and for spreading chips on bituminous treated roads. Write to Ajacks Mfg. Co., 112-122 Roosevelt Ave., Belleville 9, N. J. for Catalog No. N-39-4 describing this unit. Check the reply card.

Stay Dry With Plastimayd Rainwear

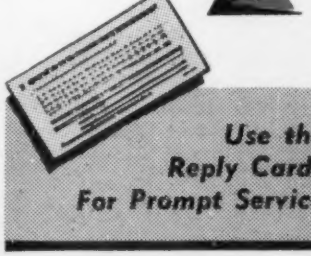
474. Literature is available from Plastimayd Products Corp., Portland, Oregon, on plastic service jackets, utility pants and jackets, rain pants and parkas. Check the reply card for information on this rainwear for maintenance and construction crews.

Method For Removing Sand and Silt From Water Supplies

478. Information on the Dorrclone desanding system is available from Dorr-Oliver Inc., Stamford, Conn. Description, performance, design data and schematic drawing of the unit are covered. Check the reply card.

All Types of Accessories For Trucks

481. A 12-page two-color "Necessories" catalog describing and illustrating tested and approved accessories for IHC trucks is available from Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. They include items for greater comfort, economy, safety and convenience in truck operation. Check the reply card.



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Take advantage of the helpful information on proven methods, materials, services and equipment published by leading manufacturers in their literature, and for data on the latest devices designed to help you in your work. Our Readers' Service Department is always ready to assist you in finding the quickest and most economical answer to your problems.

COLLECT KNOW-HOW IN A HURRY See pages 34 to 52 and 201 to 206 for a quick review of new products and valuable literature. To get the data you need, circle corresponding numbers on the tear-out card on this page, print your name, title and address, and drop in the mail.

Streamline assembly of information.

One card does the job for you.

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BUSINESS REPLY CARD
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200 SOUTH BROAD STREET

RIDGEWOOD, N. J.

8-57

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New Products, pages 201 to 206

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Meetings and Conventions

North Carolina Section, AWWA
Durham, N. C., Aug. 19-23

Pennsylvania Sewage and Industrial Wastes Ass'n
University Park, Pa., Aug. 28-30

Wisconsin Section, AWWA
Milwaukee, Wisconsin, Sept. 4-6

New York Section, AWWA
Upper Saranac Lake, N. Y., Sept. 11-13

South Dakota Sewage and Industrial Wastes Ass'n
Sioux Falls, S. D., Sept. 11-13

New England Water Works Ass'n
Boston, Mass., Sept. 15-18

International Municipal Signal Ass'n
Miami Beach, Fla., Sept. 16-19

Ohio Section, AWWA
Cincinnati, Ohio, Sept. 18-20

Public Works Congress and Equipment Show
Philadelphia, Pa., Sept. 22-25

New Mexico Sewage and Industrial Wastes Ass'n
Santa Fe, New Mexico, Sept. 23

Kentucky-Tennessee Section, AWWA
Louisville, Ky., Sept. 23-25

Institute of Traffic Engineers
Detroit, Mich., Sept. 25-26

Rocky Mountain Section, AWWA
Santa Fe, New Mexico, Sept. 24-25

Georgia Sewage and Industrial Wastes Ass'n
Atlanta, Georgia, Sept. 25-27

Okla. Sewage and Industrial Wastes Ass'n
Stillwater, Okla., Sept. 25-26

North Dakota Sewage and Industrial Wastes Ass'n
Fargo, N. D., Sept. 25-27

Michigan Section, AWWA
Detroit, Mich., Sept. 25-27

North Central Section, AWWA
Fargo, N. D., Sept. 25-27

Missouri Sewage and Industrial Wastes Ass'n
St. Louis, Mo., Sept. 29-Oct. 1

Missouri Section, AWWA
St. Louis, Mo., Sept. 29-Oct. 1

Federation of Sewage and Industrial Wastes Ass'n
Boston, Mass., Oct. 7-10

Southwest Section, AWWA
Oklahoma City, Okla., Oct. 13-16

Iowa Section, AWWA
Des Moines, Iowa, Oct. 16-18

West Virginia Section, AWWA
Wheeling, West Va., Oct. 23-24

New Jersey Section, AWWA
Atlantic City, N. J., Oct. 24-26

California Section, AWWA
San Jose, Calif., Oct. 30-Nov. 1

American Public Health Ass'n
Cleveland, Ohio, Nov. 11-15

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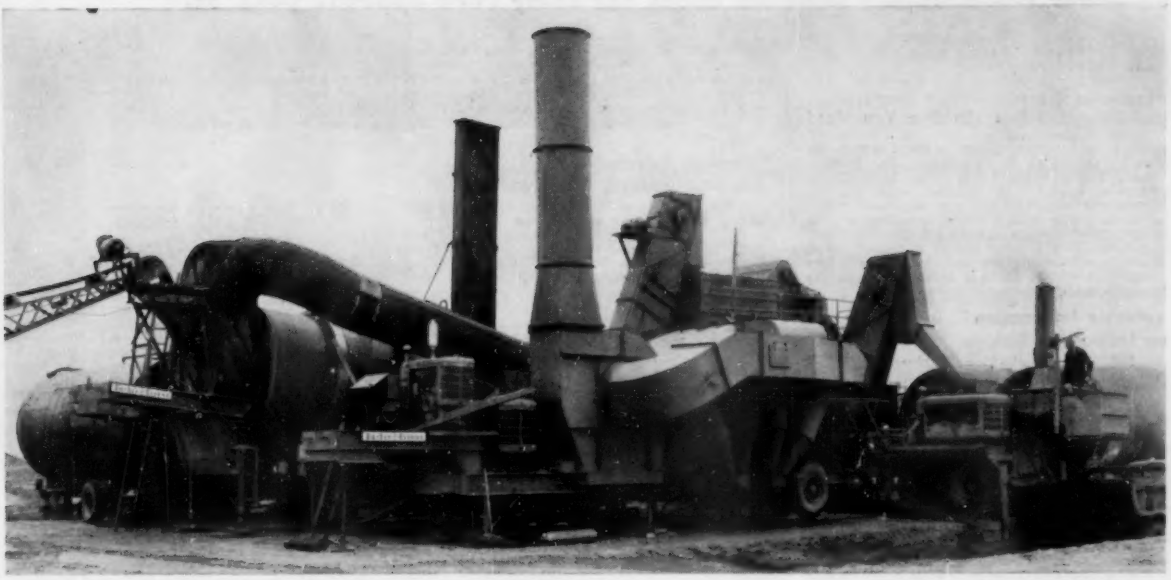

How to lower the cost of asphalt paving

with Barber-Greene Continuous Plants . . . available in capacities from 20 to more than 200 tons per hour. Built for maximum portability, these plants produce all types of mixes at highest capacity, and for lowest operating cost. Once the proportions are set, operation is automatic; the human element is eliminated and manpower requirements are reduced to a minimum.

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To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

Pneumatic Ejectors—Their Operation and How to Select the One You Need

500. Comprehensive data on pneumatic ejectors is furnished in a 28-page catalog issued by the Ralph B. Carter Co., 210 Atlantic Street, Hackensack, N. J. The principle of operation, construction features, operating arrangements and controls are discussed fully. Selection charts with illustrative examples help in specifying the proper ejectors, air tanks and compressors. Complete layout dimensions and sample specifications are included. To get this valuable reference, Bulletin 5408, just check the handy coupon.

Valuable Information on Incinerator Stokers

505. The Combustion Engineering stoker is described fully in Catalog No. IS-1 which is available from Combustion Engineering, Inc., Combustion Engineering Bldg., 200 Madison Ave., N. Y. Schematic drawings of the units, advantages of incineration, firing methods, design and performance are sections covered. Check the reply card today.

How to Select the Proper Snow Plow For Your Truck

512. One-way blade, reversible blade and V-type truck plows, V-type and wing plows for motor patrol graders, jeep plows, plow and truck wings, and industrial tractor plows are described in literature form the Wausau Iron Works, Wausau, Wisc. Check the reply card today for complete information on snow plows.

Plastic Pipe For Liquids and Gases

514. Kraloy rigid polyvinyl chloride plastic pipe can be used for liquids and gases and will not rust, rot or corrode. Write to Kraloy Plastic Pipe Co., 4720 E. Washington Blvd., Dept. PW-87, Los Angeles, Calif., or check the reply card for complete details on this lightweight pipe.

Packaged Control System For Remote Positioning of Valves

525. The Sparton-Cash standard series 300 packaged control system is for remote positioning of cone, butterfly, plug and ball valves, sliding stem valves, throttles, rheostats and other final control valves. For general description, features, operation, specifications and applications write A. W. Cash Co., P. O. Box 551, Decatur, Illinois, or check the reply card.

Complete Information on the New Highway Program

531. Find out how, where and when the money will be spent on the new highway program; standards for the new freeways; and final routes of the Interstate System. Check the reply card or write Dept. PW-8, Caterpillar Tractor Co., Peoria, Illinois, for all this information.

New Chemical Discovery Keeps Rock Salt From Caking

535. Sterling Storite is a chemical agent developed especially to keep ice-covered rock salt from caking in storage. The chemical is easy to apply and two pounds will protect one ton of salt. For complete details and information on this chemical write for illustrated bulletin to International Salt Co., Inc., Scranton 2, Penna., or check the reply card.

Pre-Assembled Dowel Units For Highway and Airport Construction

537. Laclede dowel assemblies for expansion, contraction and construction joints are precision welded into one unit and are maintained in rigid alinement. For full details write Laclede Steel Co., St. Louis, Mo., or check the reply card today.

Snow Plows For Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.

3-Way Instrument Locates Underground Pipes and Leaks

540. A single instrument, the Goldak Model LC-15, provides all-around help in water system maintenance by locating pipes and valves and detecting leaks. One-man operated, accurate and dependable, this instrument is fully described in the booklet entitled "Locating Underground Pipes" and related literature. Get your copy from the Goldak Company, Inc., 1544 W. Glenoaks Blvd., Glendale 1, Calif. Check the reply card today.

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WATER WORKS

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP 56-1 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 50 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

Elevated Tanks and Other Storage Facilities

32. Specification sheet covering elevated tank sizes and design and illustrated brochure available from the Darby Corp., Kansas City 15, Kansas.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., 225 No. Temple City Blvd., El Monte, Calif. furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the reply card for your copy, or write for Bulletin 314.

To order these helpful booklets check the reply card opposite page 34.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletins for engineering data, diagrams of typical installations and details of component parts. Check the reply card or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Automatic Valveless Filter

127. Bulletin describes fully the operation of the Permutit automatic valveless filter. The filter can be used wherever gravity flow is feasible. Check the reply card or write The Permutit Co., 330 West 42nd St., New York 36, N. Y.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the reply card or write F. B. Leopold Co., Inc., Dept. PW., 227 So. Division St., Zelienople, Pa.

For Prompt Service Use The Reply Card

Valuable Information on Underground Pumping Stations

246. The complete prefabricated underground pumping station is fully described in a bulletin just released by Zimmer & Francescon, 1715 Fifteenth Street Place, Moline, Ill. Construction features, corrosion control, electric controls, specifications, pumping equipment and installation are a few of the items covered. Check the reply card.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Hortonspheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check reply card for your copy.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Division, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin F-552 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Electric Generator Plants

325. Mobile electric generating plants that provide an output of 2300 watts, 115 volts AC are described in literature available from Pioneer Gen-E-Motor Corp., 5841 West Dickens Ave., Chicago 39, Ill. Weigh 200 lbs. and can be mounted on rubber tires or steel skids.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing. Check the reply card for this interesting literature.

To order these helpful booklets check the reply card opposite page 34.

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Does Your Water Works Have Standby Power?

224. Climax Engines are used in Municipal Water Works to supply dependable power during emergencies. They are available in a range of sizes from 40 to 600 HP and operate on either natural gas, butane, gasoline or a combination of these fuels. Use the handy reply card to obtain complete details and literature from Climax Engine Mfg. Co., 208 S. La Salle St., Chicago 4, Illinois.

Amvit Mechanical Jointed Clay Pipe

298. The new Amvit jointed vitrified clay pipe in sizes 4 through 24 inches with the true "built in" mechanical joint ready for immediate and easy installation is infiltration and root-proof. Offers better flow and less maintenance and permits deflection and absorbs shocks. It is furnished on all standard fittings and permits immediate backfilling and testing. For literature write to American Vitrified Products Co., National City Bank Building, Cleveland, Ohio, or check the reply card.

Dependable Standby Power For Water Pumping

342. The use of LeRoi generator sets for dependable low-cost standby power is discussed in an attractive bulletin, No. G-6, issued by LeRoi Div. Westinghouse Air Brake Co., Milwaukee 14, Wis. Detailed specifications are included. Check the reply card for your copy.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

Welded Steel Pipe from 6 to 10 3/4" Diameter

382. High grade butt welded light-weight steel pipe from 8 to 16-gauge in 20, 30 and 40-foot lengths, plain or asphalt coated, with choice of joints. Also available up to 0.188 wall. Check uses for municipal water lines, irrigation, well casings and many other applications. Self explanatory literature from Valley Mfg. Co., Valley, Nebraska.

A Precast Concrete Filter Bottom

394. The Criscrete unit is precast prestressed concrete built monolithically spanning the entire width of the filter in one piece. It requires 6 in. overall depth in the filter and employs non ferrous nozzle liners. For complete information on this filter unit get literature available from MCG Co., 1771 W. 5th Ave., Columbus 12, Ohio.

One Man Field Tool Machines Any A-C Profile

475. Literature is available from Spring Load Mfg. Corp., 3610-D First Ave., South, Seattle 4, Wash., describing the Model B Spring Load A-C machinery and tapering tool. Also information on Spring Load A-C pipe cutters are included. Check the reply card.

U. S. Tyton Joint Pipe

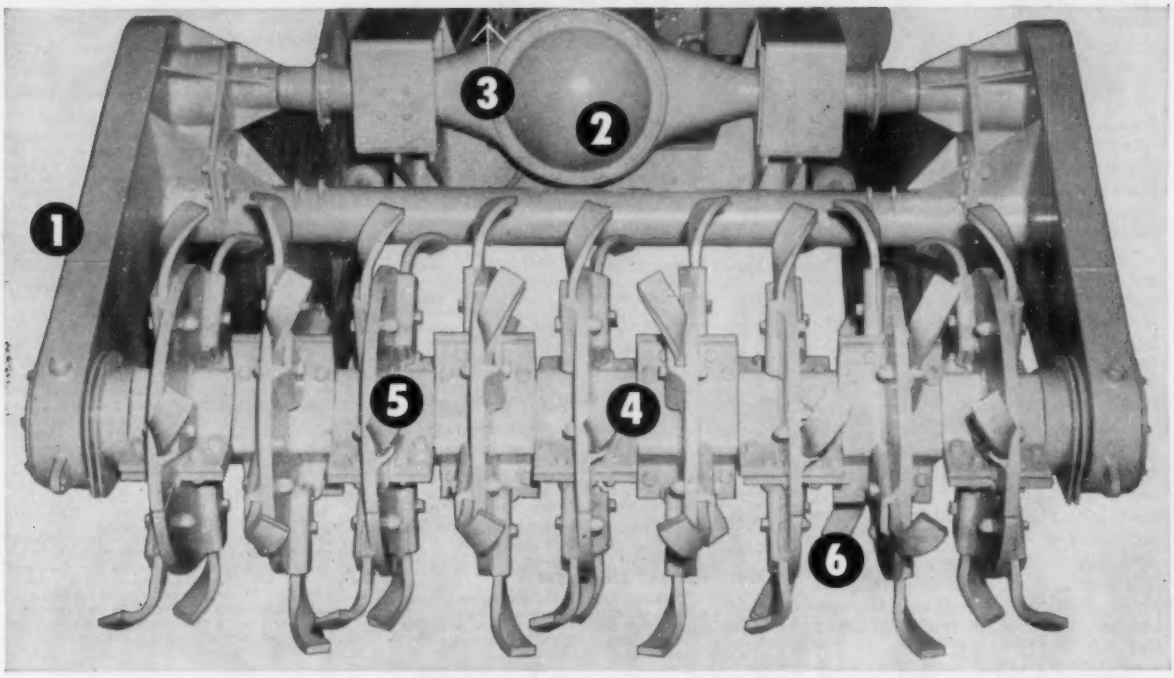
490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

Diatomite Filters in Water Filtration

596. A new line of IWF diatomite filters is featured in this 10-page Bulletin 651 by the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. The IWF is ideal for medium and small town water supplies and the bulletin provides installation drawings, sectional views and operational sketches. Check the reply card for your copy of this helpful bulletin.

To order these helpful booklets check the reply card opposite page 34.

If you are doing Soil Stabilization work, you know why this design is so important



The BROS Roto-Mixer's performance during the past two construction seasons has been sometimes described as truly amazing. If you know in-place soil stabilization machines and jobs, as you review the design features below, you'll readily understand why.

CUTS MIXING TIME

1. Because drives are at outside ends of the rotor shaft, even mixing is accomplished in one pass. No need of a second pass to provide uniform mixing.

Full width mixing or any increment up to 7′ is easily handled. Split-disk type tool plates are quickly removed for shoulder maintenance or other narrow work.

2. Three-speed transmission and 150 usable HP at 1800 RPM provides a greater range of mixing speed . . . and mixing control which eliminates "surging" effect.

3. Independent hydraulic control of rotor and hood provide ample space for proper mixing to 12″ depths. Materials are uniformly blended in a smooth, even course.

CUTS MAINTENANCE COSTS

4. 6″ square solid steel rotor shaft easily withstands shocks and strains of in-place mixing of rocky soils.

5. Split-disk type tool plates are of heavy-duty construction; quickly and easily removed or remounted.

6. Simplified tool holders. Heavy-duty mixing tools are socket mounted, held by one bolt. Replacing worn tools is done in minutes.

You'll be glad to learn of the other important design and construction details of the Roto-Mixer. So see your nearest BROS Distributor for full information and a demonstration. Or write us today.

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Road Machinery Division

BROS *Incorporated*

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Dodson's Digest

Charity begins at home

I wasn't surprised when I had to wait a few minutes for my appointment at Joe Parsons' office the other day. Joe is a highway contractor, and he's been pretty busy this summer with road-building programs.

"Public relations is important in my business," Joe explained. "The man who just left was asking me to sponsor our local Little League baseball team. I believe in doing my part, but I don't think I should have to do it alone. So I told him to find somebody else to pay half the cost, and I would take care of the other half."

"That sounds more than fair," I agreed. "And speaking of public relations, did you follow my suggestion about using Calcium Chloride to keep down dust on unpaved detours?"

"I sure did, Dod," Joe replied, "and, believe me, dustfree detours are good public relations. Motorists really appreciate them. And traffic is faster and safer."

"Calcium Chloride makes surfaces more compact, too," I pointed out. "That means your men spend less time maintaining the detours."

"And that's not all," Joe went on. "I found that treating other areas around the job with Calcium Chloride provides a better work surface . . . increases the efficiency of my equipment. It helps keep the work moving on schedule. Besides being good public relations, Calcium Chloride more than pays for itself."

Just then the man from the Little League returned. "I've found another backer for the other half, Mr. Parsons," he announced.

"Fine," Joe said, writing out a check and handing it to him. "Do you mind telling me who it was?"

"Not at all," he replied, carefully folding the check and putting it in his pocket. "It was Mrs. Parsons."

— L. D. Dodson

P.S. — No matter what your dust problem is, our leaflet, "How To Stop Bothersome Dust," will give you hints on how to solve it with Wyandotte Calcium Chloride. For your free copy, just drop me a line. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

Modern Water Storage in Elevated Steel Tanks

511. A new edition of a catalog on modern water storage in elevated steel tanks has been published by Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh 25, Pa. The 20-page bulletin includes dimensional data and capacities for six basic PDM tank types, in addition to many installation pictures and descriptions. Check the reply card today for your copy of this valuable catalog.

Data on Mechanical Joint Tapping Valves and Sleeves

605. Eddy mechanical joint tapping valves and sleeves are described in literature available from Eddy Valve. Also described are repair sleeves for cast iron and asbestos cement water mains. Write Eddy Valve Company, Waterford, New York, or circle the reply card for your copy.

Paints For Bridges, Water Tanks & Other Metal Structures

624. Flake silica graphite paints for outdoor metals are described fully in literature from Paint Sales Div., Joseph Dixon Crucible Co., Jersey City 3, N. J. Check the reply card for details on these primer and protective paints.

Water Tanks, Reservoirs and Standpipes

631. Data on steel water tanks, reservoirs and standpipes of all capacities are included in literature available from Graver Tank & Mfg. Co., Inc., East Chicago, Ind. These units are fabricated and erected by the company. Check the reply card.

Flexible Plastic Pipe For Water Distribution

700. A new-type polyethylene resin flexible pipe is described in Catalog No. 401 available from Orangebrug Mfg. Co., Inc., Orangeburg, N. Y. Fittings, installation, size and weight tables and physical properties are several of the sections covered. Check the reply card.

Simplify and Save on Public Works Electrical Construction

710. Information and literature is available from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa., on how you can simplify electrical details of a public works project. Westinghouse field specialists will help you plan the electrical system to fit your need. Check the reply card.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet to be made on business letterhead.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 64-page Catalog 905. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use card or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Complete Information and Installation Data on Clay Pipe

225. A fully illustrated bulletin containing complete data on vitrified clay pipe with pre-assembled Tylox flexible couplings has just been released by Universal Sewer Pipe Corporation, 1500 Union Commerce Building, Cleveland 14, Ohio. Complete information on Universal's rubber, neoprene and polyvinyl chloride resin types of Tylox couplings is included. Check the reply card today.

Semi-Steel Valve For Water and Sewage

266. A completely revised 43-page bulletin covering the entire Rockwell-Nordstrom semi-steel valve line has been issued by Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa. Drawings and detailed description of Rockwell-Nordstorm lubricants and lubricating methods and cutaway photos showing in detail the working parts of the valves are included. Check the reply card.

Use The Reply Card

How and Where to Install A Septic Tank System

270. A manual on modern sewage disposal methods for individual dwellings, camps and rural schools has been released by Brown Co., 150 Causeway St., Boston, Mass. Location, size of and building the tank, how large a disposal field and laying out the field are discussed. Check the reply card today.

Centrifugal and Turbine Type Pumps For Water and Sewage Plants

321. Turbine-type pumps, close or flexible couple drive, side suction centrifugal pumps and mixed flow pumps are described in Catalog M available from Aurora Pump Div., The New York Air Brake Co., Loucks at Dearborn, Aurora, Ill. Included is a pump selection guide. Check the reply card.

Roll-On Joint Pipe For Water, Sewage or Other Liquids

388. American Roll-on Joint Pipe that is centrifugally cast in sand-lined molds for water, sewage or other liquids is described completely in catalog just released by American Cast Iron Pipe Co., Birmingham, Alabama. Applications, specifications, design, class, assembly and disassembly are included. Check the reply card.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 60 East 56th St., New York 17, N. Y. or check the reply card.

Complete Treatment Unit for Handling Flows to 0.5 MGD

503. Developed for sewage flow characteristics of small communities, the Aerator-Clarifier is a complete treatment unit utilizing automatic balance of activated sludge solids with sewage flow. Bulletin 129, issued by the Chicago Pump Co., 422 Diversey Parkway, Chicago 14, Ill., describes application of this unit. Check the reply card.

To order these helpful booklets check the reply card opposite page 34.

Data on Adjustable-Speed

Helpful Booklet on Carryable

NOW

Another New and Bigger Forward Control 'Jeep' Truck

Here's the bigger, more powerful, 7,000-pound GVW Forward Control 'Jeep' FC-170 Truck:

- **Advanced Forward Control design!** The same new, advanced features that made the Forward Control 'Jeep' FC-150, an immediate success.
- **More cargo space on less wheelbase!** A 9-foot flatbed pickup box on a wheelbase only 103½-inches long! Bed is 27-inches from ground for back-saving ease of loading!
- **More efficient space utilization!** Compare it with any other 4-wheel drive truck — *only* the FC-170 gives you so much cargo space per inch of wheelbase!
- **All-time high for "big-load" maneuverability!** The FC-170 is the *only* 4-wheel drive truck to give you "go-anywhere" 'Jeep' maneuverability with a payload capacity of up to 3500-pounds.
- **Other outstanding features!** It's really a 4-wheel drive truck — *not* a modified 2-wheel drive truck, *not* a conversion! High-torque Hurricane 6-226 engine, time-tested and performance-proved • spacious Safety-View Cab • big wrap-around windshield • wide 63-inch tread for ground-gripping stability in off-road travel • shifts easily into 2-wheel drive for highway travel • with power take-off, operates a wide range of special equipment from winches to belt-driven machinery.

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SPACIOUS SAFETY-VIEW CAB puts you in a "Forward Control" position, gives you greater command of any driving situation.

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WILLYS... world's largest manufacturers of 4-Wheel-Drive Vehicles

Willys Motors, Inc., Toledo 1, Ohio

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

465. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

Trickling Filter Systems For Small Sewage Plants

506. Trickling filter systems for the small sewage treatment plant, such as required for isolated, institutional, industrial and residential developments, are detailed in a 24-page manual available from Yeomans Brothers Co., 2000-1 North Ruby St., Melrose Park, Ill. In addition to the trickling filter distributors the catalog also gives specifications and suggested sizes for the Spiragster. Check the reply card for Manual 6769.

V-Notch Chlorinators For Water and Sewage Plants

590. Bulletins on the Series A-711 and the Series A-712 chlorinators are available from Wallace & Tiernan Inc., Box 178, Newark, N. J. Covered in the literature are design features that include operation, installation and maintenance. Simplified flow diagrams in color are included showing the operation of the units. Class, capacities, feed ranges and electrical requirements are described in the technical data section. For your copies, check the reply card.

Literature on Diesel and Dual-Fuel Engines

660. A complete file of literature on diesel and dual-fuel engines in the 225 to 1025 hp range is available from White Diesel Engine Div., The White Motor Co., Springfield, Ohio. General dimensions, specifications, performance horsepower and kw ratings are fully covered. Check the reply card.

Controls For Use in Pumping Stations and Sewage Plants

662. Single and multi-pump sump controls, pressure operated for use in pumping stations and sewage disposal plants are described in literature available from Healy-Ruff Co., Water Level Controls Div., 2255 University Ave., St. Paul 14, Minn. The two principal types of pressure operated sump controls are covered along with general descriptions and features. Check the reply card.

Spiragester, A Combination Clarifier and Digester

709. A 22-page catalog is available from Lakeside Engineering Corp., 222 W. Adams, Chicago, Ill. describing the Spiragester. Check the reply card for operation of the unit, advantages, specifications, samplers and painting.

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CONSTRUCTION EQUIPMENT AND MATERIALS

How the "Payloader" Helps Public Officials

190. An attractive booklet "Getting More for the Tax Dollar with Payloaders" makes worthwhile reading for every public official in charge of construction and maintenance of roads, streets, and utilities. You will find illustrations and data showing dozens of ways the "Payloader" is used by cities, counties and states, plus convenient specifications on seven models. Check the reply card or write Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Complete Line of Concrete Gunning Equipment

208. A 16-page catalog that gives complete details, specifications and operating capacities of concrete gunning equipment and answers to many of the questions asked about air placed or gunned concrete is available from Air Placement Equipment Co., 1009-11 West 24th Street, Kansas City 8, Mo. Also included are several pages of actual job application photographs showing the many and varied uses of this modern equipment.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Requirements are outlined for many applications. Check the reply card for your copy. Homelite Div. of Textron Inc., 2125 Riverdale Ave., Port Chester, N. Y.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Massey-Harris-Ferguson, Inc., Industrial Division, 1009 S. West St., Wichita, Kans., describing the new Davis backhoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication.

Joint Materials and Sealers Described in Latest Literature

492. Fibre material, asphalt board, cold pour joint sealer, crack fillers and concrete curing compound are described fully in literature available from Presstite-Keystone Engr. Products Co., 3906 Chouteau Ave., St. Louis 10, Mo. Check the reply card for information on these paving and building products.

Blade For Tractor Makes Efficient Earth Mover

497. Literature on a rear mounted blade that fits most makes of light tractors is described in literature available from Danuser Machine Co., 533 East 3rd St., Fulton, Mo. Rugged construction makes this heavy-duty tool fine for landscaping, grading, ditching, scraping and backfilling.

Fifty Combinations of Matching Equipment For Case-Terra Trac Tractors

617. Dump loaders, angledozers, bulldozer blader, backhoes, mowers and scarifiers are several of the attachments available for the 40 to 100 hp Case-Terra Trac crawlers and industrial wheel tractors. For complete information on the attachments and tractors write J. I. Case Co., Racine, Wisc., or check the reply card.

Trencher For Ford and Ferguson Tractors

688. The mobile tractor mounted trencher digs clean trenches up to 5 feet deep and as fast as 300 feet per hour. Check the reply card for literature on models and specifications or write Earth Equipment Corp., 2036 Sacramento St., Los Angeles 21, Calif.

Power Loader For Handling Heavy Materials

689. This power loader fits any standard truck chassis and is operated from a power take-off through the engine transmission. For complete specifications and data write Daybrook Hydraulic Div., L. A. Young Spring and Wire Corp., Bowling Green, O., or check the reply card.

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

To order these helpful booklets check the reply card opposite page 34.

"..most useful equipment we have..

says N. K. Stogsdill, Street Commissioner, Beech Grove, Indiana

"We keep it busy all the time . . . saves manpower and man-hours", according to Mr. Stogsdill. Communities of any size can benefit from his experience . . . buying a piece of equipment that will do many jobs is a money-saving investment.

A "PAYLOADER" tractor-shovel not only gives you greater material-handling versatility, but the most machine for your dollar investment. It gets to the job fast, under its own power, travels and works on paved or unpaved surfaces and, with a complete line of attachments, handles more jobs than any other tractor-shovel. That is why there are more "PAYLOADER" units in service than all other makes combined.

There is a "PAYLOADER" size for every use: *Small models* (up to 3,000 lb. carry capacity) are fast, easily maneuvered, work in close quarters, indoors and out. *Large models* (up to 9,000 lb. carry capacity) are big and rugged, with an abundance of traction, balance, digging power . . . have power-shift transmission, planetary final drives, power-transfer differentials, 4-wheel-drives.

Useful attachments include: hydraulic back-hoe; pick-up street sweeper; snow plow (blower, "V" and blade types); backfill blade; winch; crane hook; fork lift. Call the nearby Distributor today—ask him to prove that a "PAYLOADER" is the most useful machine your community can own.

"Our 'PAYLOADER' is used in stockpiling materials, in loading, for snow removal, sweeping and leaf collection, back-filling, handling of heavy pipe and all types of heavy material. With a simple blade change, we have a grader. In tree removal, we cut the heavy limbs and trunks to lengths which will fit the 'PAYLOADER' bucket for loading. It's pretty quick, the way we do it".

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Ill.

Send "PAYLOADER" information as checked:

- ☐ Small models (to 3,000 lb. carry cap.)
- ☐ Large models (to 9,000 lb. carry cap.)
- ☐ Useful "PAYLOADER" attachments

Name _____

Title _____

Gov't. Unit _____

Street _____

City _____ State _____

107

To order these helpful booklets check the reply card opposite page 34.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 20, Calif.

Information on The Ottawa Heavy-Duty Backhoe

25. Features of this backhoe are an automatic ejector bucket; two levers do four operations; and a powerful hydraulic system with mechanical linkage to provide more digging power. For complete details check the reply card or write Ottawa Steel Div., L. A. Young Spring & Wire Corp., Ottawa, Kans.

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 180° arc and dig to a depth of 12 feet. For full details check the reply card. Sherman Products, Inc., Royal Oak, Mich.

How to Select Prestressed Concrete Bridge Members

26. Colorful folder, well illustrated, shows manufacture of "Amdek" prestressed bridge members and provides selection tables covering several AASHO loadings. Full data from Concrete Products Div., American Marietta Co., 104 East Ontario St., Chicago 11, Ill. Check the reply card for your copy of this helpful reference bulletin.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the reply card.

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

Literature on Barber-Greene Wheel Ditcher

97. An attractive 8-page bulletin on the Model 774 wheel ditcher is available from Barber-Greene Co., 400 No. Highland Ave., Aurora, Ill. Features of the ditcher and job pictures are included. Check the reply card.

Trail-O-Patcher Bituminous Mixer

102. Bulletin HH-28 on the Trail-O-Patcher bituminous mixer is available from Littleford Bros., Inc., 453 E. Pearl St., Dept. HH-28, Cincinnati, O. The bulletin gives a presentation of facts and diagrams on the unit and also its operational features. Check the reply card.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio. Use the reply card to get your copy.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clarke Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

"A Complete Package" of Road Building Equipment

261. A new catalog describing the road widener, trench roller and base paver has been released by Blaw-Knox Co., Construction Equipment Division, Pittsburgh 38, Pa. Illustrations, specifications and operation procedures are fully covered. Check the reply card today.

Better Field Testing for Highway Foundations

279. A new soil testing device for making field density and moisture tests is suitable for use in all soils, including fine, coarse, granular base and gravel. Called the Washington Densometer, it features unexcelled accuracy, completes tests in 3 minutes, is light weight, compact and economical to operate. Get further details from Charles R. Watts Co., 4121 Sixth Ave. NW, Seattle 7, Wash.

Overlaid Fir Plywood For Street and Highway Signs

304. Literature is now available on Harborite, an overlaid fir plywood, for street and highway signs. One booklet covers the results of tests conducted on the use of overlaid plywood for signs and another bulletin includes a sample of Harborite and additional information on its use in municipal, county and state traffic departments. Check the reply card or write Harbor Plywood Corp., Aberdeen, Washington.

To order these helpful booklets check the reply card opposite page 34.

MUELLER

AWWA Improved Fire Hydrant

add pumper nozzles to your present hydrants!

Pumper nozzles may be quickly added to your present two-way Mueller Improved Fire Hydrants at very little cost. Just order a new upper barrel, with the nozzle combination you need, and switch it with the old one.

Better still, in place of that two-way hydrant you were going to order for a new area, order a hydrant with pumper nozzle. Then simply switch upper barrels, putting the pumper nozzle on the already-installed lower barrel and installing the two-way from your present hydrant and the new lower barrel in the new subdivision.

All operations are completed in a short time and from ground level — no digging or water shut-off is required because of the safety flange construction.

Consult your Catalog W-96, your Mueller Representative or write direct for full details on the many other features of the Mueller Improved Fire Hydrant.

...designed for above-ground maintenance!

Manufacturers of a complete line of fire hydrants for municipal, industrial and private fire protection systems.

Since 1857

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

To order these helpful booklets check the reply card opposite page 34.

Eaton 2-Speed Axles For Your Trucks

264. Truck axles that provide easy shift, supply positive lubrication and have a self-contained air brake are available from Eaton Mfg. Co. For complete information on these rugged axles check the reply card or write Eaton Mfg. Co., Cleveland, Ohio.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

How "Gradall" Applications Meet Your Job Needs

310. A new, profusely illustrated bulletin showing Gradall machines at work on a wide variety of municipal, county, township and highway maintenance and construction jobs has been issued by the Gradall Div., Warner & Swasey Co., Cleveland 3, Ohio. Production figures are provided to show the work output of this machine on all sorts of applications. Get your copy by checking the reply card. It's a convenient review of the many ways you could use a Gradall machine.

Weeds Controlled by Using Simazin and Related Compounds

318. General weed control is accomplished by using Simazin and water. For full information on this herbicide and how to use it write Geigy Agricultural Chemicals, Saw Mill River Road, Ardsley, N. Y. Check the reply card today.

For Prompt Service Use The Reply Card

Soil-Cement Construction Handbook

302. Soil-cement construction, road construction, street construction, airport paving, storage and parking areas, widening and shoulders, and inspection and field control are the subjects covered in this 102-page manual available from Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

Catalog on Utility Bodies and Equipment

360. General service bodies, line construction bodies, aerial equipment, winch and derrick equipment and trailers are the units covered in this catalog. For design, dimensions, illustrations and descriptions check the reply card or write McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo.

Go-Anywhere Transportation Provided by the "Jeep" Family

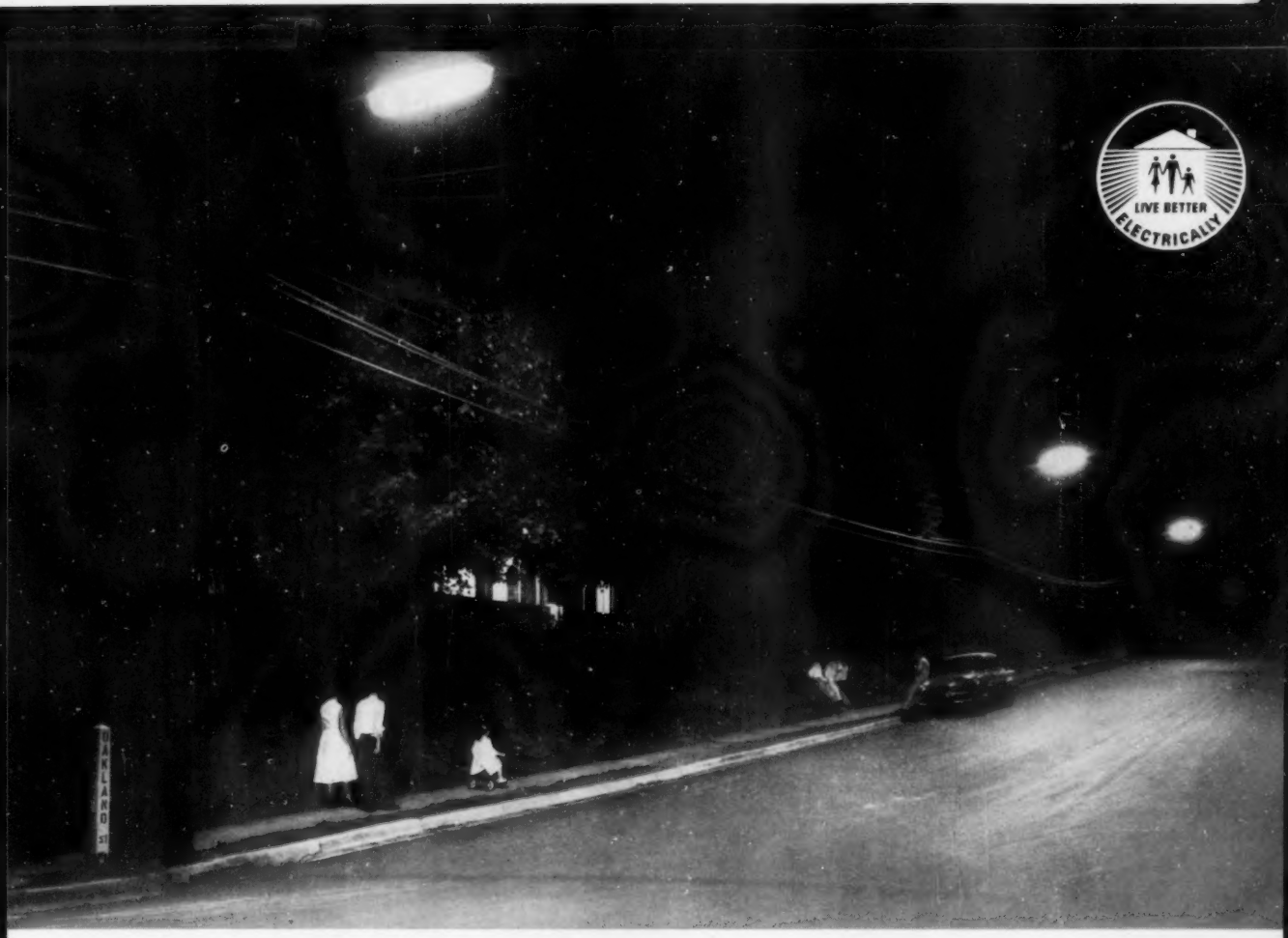
377. A new booklet which graphically portrays the wide range of uses of "Jeep" vehicles in public service is now available from Willys Motors, Inc., Toledo 1, Ohio. Specifications, special equipment, accessories and plenty of photographs of the jeep in action are included. Just check the coupon for your copy.

Better Traffic Signs By Using Plyglaze Overlaid Plywood

496. Plyglaze high density overlaid plywood requires no protective paint coating when used for traffic control signs. The plyglaze surface provides an ideal base for permanent weatherproof bonding, and it will not check, blister or deteriorate when marred by bullet holes. For further information write St. Paul & Tacoma Lumber Co., Dept. P.W., Tacoma 1, Wash., or check the reply card.

Manual on Apparatus For Tests of Soils, Concrete and Asphalt Materials

518. The new 128-page catalog released by Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill., contains descriptions and illustrations of over 1350 items of apparatus for engineering tests of soils, concrete, asphalt and construction materials. It lists items ranging from pocket penetrometers for soil, to pavement deflector instruments for asphalt, and 200,000 pound compression testing machines for concrete.



Are your residential streets alive after dark?

Few municipal services are as noticed and appreciated by the average citizen as good street lighting on the block where he lives.

For one thing, he can't miss its very *visibility*. He knows it enables his children to play outside, or his wife to stroll to the neighbor's—safely—after dark. He likely notices a more cheerful atmosphere and greater sociability around the neighborhood than before modern street lighting was installed.

Besides, his home is his largest material investment. He likes the night-long "police protection" that the light gives against break-in and other crime. And, after all, why should modern residential streets have old-fashioned lighting service—a puddle of light up at the corner, if any at all?

Good street lighting is a bright symbol of good municipal service. It's an example for your taxpayers to see *and remember* every night. Compare the low cost of $2.50 to $4.00 per capita annually to any other municipal service you can provide. This low cost—a national average—is the total needed for good lighting—city limit to city limit. Shouldn't 1957 be *the year* for your community?

"OUT OF DARKNESS," a new, dramatic film story of how one community met its street-lighting problems, is now available to civic groups, community service organizations, etc. This 16-mm, sound, black and white movie runs 26 minutes. Borrow a print of "Out of Darkness" from your nearest General Electric Apparatus Sales Office, or write our Schenectady, N. Y., Office.

Section C455-17
General Electric Company, Schenectady, New York

Please send me a free copy of the 16-page bulletin on residential street lighting.

NAME .....

STREET .....

CITY ..... **STATE** .....

GENERAL ELECTRIC

To order these helpful booklets check the reply card opposite page 34.

Complete Line of Road Rollers and Compaction Equipment

520. Buffalo-Springfield's complete line of road rollers and compaction equipment is described in a 12-page illustrated Buletin No. S-73-157 just released by Buffalo-Springfield Roller Co., Division of Koehring Co., Springfield, Ohio. Check the reply card for on-the-job pictures, as well as construction details of the 2-axle tandems, 3-axle tandem, 3-wheel rollers and the K-45 Kompactor.

Reflectorized White or Yellow Crosswalk Markings

578. Crosswalk markings of Perma-Line, the quick setting line that is easily applied, trouble-free, economical, and which outlasts paint 4 to 6 times, is described in literature of the Veon Chemical Corporation, 22-09 Bridge Plaza North, Long Island City 1, N.Y. Available in reflectorized white or yellow. Tests under your local conditions are invited.

Hydrocrane Used As A Backhoe, Crane or Clamshell

606. When your work calls for lifting, digging and trenching all in the same day you need a machine that converts from crane to clamshell to hoe quickly and easily. Check the reply card or write Bucyrus Erie, South Milwaukee, Wisc. for information on the Hydrocrane.

Construction Methods for Salt Stabilized Roads

609. A comprehensive booklet showing modern methods of salt stabilization is available from the Morton Salt Co., 120 So. LaSalle St., Chicago 3, Ill. Stabilized secondary roads, base courses and shoulders are discussed and all equipment and construction methods are covered. Just check the reply card for your copy.

Information on Photogrammetric Engineering

682. Find out how aerial surveys will advance starting time of construction jobs, conserve engineering manpower, produce fast but factual data and is economical but exact. Check the reply card or write Air Survey Corp., 1101 Lee Highway, Arlington 9, Va. today for complete information.

Light Duty Trucks For Construction and Maintenance

628. Pickup and stake body trucks are fully described in literature from Ford Div., of Ford Motor Co., Dearborn, Mich. Pickups are available in 6½, 8 and 9-ft. lengths. They come in standard colors and with either a 6 or V-8 engine. Rigid tailgate and steel corner posts add to the over-all body strength. The stake body trucks come in 6½, 7½ and 9-ft lengths. These units also come in 6 or V-8 engines. Check the reply card for full information.

Crezon Plywood Signs Have Long Life Expectancy

641. Crezon overlaid plywood signs are described fully in literature available from Crown Zellerbach, San Francisco 19, Calif. Material is strong and rigid, resists bending or tearing loose from the pole and there's neither checking nor blistering from heat or freezes.

Sweepers Handle A Variety of Jobs In Every Season

684. Mechanical drive one-way and pull type 2-way sweepers and hydraulic 2-way sweepers that are tractor-mounted or loader-mounted are fully covered in literature from M-B Corp., 1611 Wisconsin Ave., New Holstein, Wisc. Jobs like cleaning dust, dirt and snow from streets and highways and sweeping park lawns are a few of the sweepers applications. Check the reply card.

SNOW AND ICE CONTROL

Snow Plows for Tractors, Graders and Jeeps

207. An attractive four-page bulletin issued by Bros Inc., Road Machinery Div., 1057 Tenth Ave., S.E., Minneapolis 14, Minn. describes rotary snow plows that are for the front-end loader mounted models for wheel-type tractors and jeeps. Complete specifications are given and also the cutting widths.

Full Line of Weapons for Snow and Ice Battles

268. Whether your snow problems are heavy or light, you'll find equipment for virtually all your needs among the plows and spreaders offered by Good Roads Machinery Corp., Minerva, Ohio. The "Champion Line" of Vee plows and one way and reversible plows with safety blade trip will handle snow removal; for chlorides and abrasives spreading there are five "Jet Line spreader models and the 4-U towed spreader.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, Thousand Islands, New York.

Catalog on Equipment For Ice and Snow Control

410. Information on Baker snowplows and Flink ice control spreaders is available from The Flink Co, Dept. 5613, Streator, Illinois. Fully covered are reversible and one-way plows with hydraulic power lifts to meet every specification and single or dual spinner type spreaders. For reference catalog #110 check the reply card.

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. Check reply card for your copies.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Wyandotte. Michigan. Other uses of calcium chloride are fully outlined.

We don't blame her...

for trying to swipe a Le Roi rock drill with the new shock-absorbing handle. This remarkable innovation takes away 55% of the punishing tool kick without losing a single ounce of impact at the bit.

The secret is in the long-life torsion rubber cushion in the handle. It absorbs the liver-pounding, shoulder-jarring bounce... reduces operator fatigue . . . increases man/day output . . . keeps workers happier.

See your local Le Roi distributor. He's got the Model H10, H111, and H12 drills in stock available for immediate delivery. Or write Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

LE ROI NEWMATIC AIR TOOLS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

To order these helpful booklets check the reply card opposite page 34.

Spreading Equipment For Ice Control

543. An ice control catalog describing the full line of Baughman ice control spreading equipment has been released by Baughman Mfg. Co., Jerseyville, Ill. Included are illustrations and descriptions of truck-mounted spreader bodies, tail gate spreaders, dump body and pull type spreaders and gravity feed spreaders. For your copy of this helpful and interesting booklet check the reply card today.

Sand, Chip and Calcium Chloride Spreader For Ice Control

683. Complete specifications, performance records and prices on the Fox sand spreader are covered in literature from Fox River Tractor Co., Dept. R3, P. O. Box 469, Appleton, Wisc. Spreader can be attached or removed from most any dump truck in 15 minutes and can be operated from 5 to 40 miles per hour. Check the reply card.

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REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a soluition, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16, 20, 24 cu. yd. capacities. Get all the facts from M-B Corp., New Holstein, Wis.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 5, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

For Prompt Service Use The Reply Card

Complete Package Dravo Incinerator Plant

584. The Dravo incinerator includes receiving pits, automatic refuse handling system, automatic combustion controls, traveling grate stoker and everything necessary for the efficient operation of the plant with minimum personnel. Write for full information to Dravo Corp., Dravo Building, Pittsburgh 22, Pa., or check the reply card.

Data on Refuse Collection Bodies

615. The Hydro E-Z Pack compacting unit has only 2 working parts—a high volume roller bearing pump and a double-acting telescopic cylinder. A refuse-crushing compacting pressure of 82,500 lbs. is attained in the units. Write Hydro E-Z Pack Co., Galion, O., or check the reply card for complete specifications.

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STREET LIGHTING AND TRAFFIC CONTROL

Bulletin Gives Tips on "Light-Up Celebration"

82. A bulletin designed to aid municipal officials, civic groups and utilities in planning celebrations to mark the installation of new street lighting systems is now available from the General Electric Co., Schenectady 5, N. Y. Bulletin GEA-6462 provides a 5-step plan for organizing an effective light-up celebration. Check the reply card.

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, traffic signal posts and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St., Newark, N. J.

Traffic System Computer & Selector

260. Electro-Matic Master Equipment is fully covered in Bulletin E-222 just released by Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn. This system provides coordinated signal control responsive to traffic changes as they develop and it continually evaluates and adjusts to volume and direction of traffic.

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by the Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

Gradall loosens, lifts and loads curb sections intact, grasping curb firmly against boom with its hydraulic bucket "wrist" action.

Gradall removes 2400 feet of curb and sidewalk per day!

First, Gradall smoothly breaks out and loads large 4 to 5-foot sections of asphalt sidewalk. Then it efficiently digs out behind the curbing prior to its removal. This machine can easily work under low wires, trees or other obstructions.

Triples previous rate!

That's the average turned in on this 120,000-foot San Diego job by the R. E. Hazard Contracting Company. By the two previous methods used, 800 to 1,000 feet a day was considered very good.

Gradall first removed large sections of sidewalk, then cut out behind the curb, then grasped and loaded out curb sections intact. A cost-saving bonus resulted from the fact that the Gradall method eliminated costly pavement damage during curb removal.

Supt. Wayne W. Wallace states: "There is no way at all you can take it out cheaper than with a Gradall."

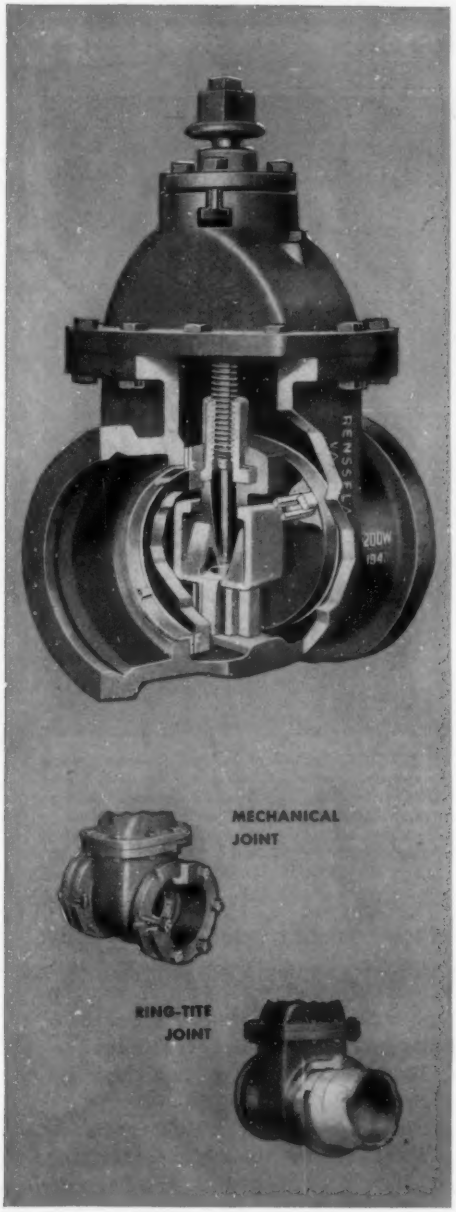
Since delivery in December, 1954, Hazard's Gradall has averaged over 200 on-the-job hours every month! They keep this multi-purpose machine busy on a wide variety of jobs—often on work no other machine could touch—jobs where Gradall's power and arm-action accuracy really pay off.

Find out exactly how a Gradall can cut costs for you. Arrange for a field demonstration now with your nearest Gradall Distributor.

Gradall®
DIVISION OF WARNER & SWASEY Cleveland
® Reg. U.S. Pat. Off.
PRECISION MACHINERY SINCE 1880

Distributors in over 75 principal cities in the United States and Canada

YOU CAN DO IT BETTER, FASTER, FOR LESS WITH A GRADALL



RENSSELAER

A. W. W. A.

VALVES

It costs more to dig up a valve than it does to be sure that the valve is right in the first place. Rensselaer A.W.W.A. Valves have been giving satisfactory service in hundreds of cities for many years, and there are many "reasons why."

The well known Rensselaer wedge mechanism, for instance, presses the gates firmly against the valve seats on closing, but on the first turn of the opening, the wedging mechanism is released and the gates are free.

The generous use of solid bronze, the rust proofing and the simplicity of servicing make for long life and low maintenance. All parts are interchangeable and accurate because of the precision casting and machining.

Only two types of valve ends are shown. All types are available together with tapping valves and other accessories.

The names, Ludlow and Rensselaer mean the same today that they have during your lifetime. The desire to serve the Water Works Field in person—in research and design and in prompt delivery of original equipment and spare parts for all products has not changed.

Ask for Bulletin "A"

16

LUDLOW & Rensselaer

LUDLOW RENSSELAER **VALVES & HYDRANTS**

Since 1861 **THE LUDLOW VALVE MANUFACTURING CO.** *Troy, N. Y.*

Hoisington, Kansas, Water Works

TRIMS OPERATING COSTS WITH AUTOMATION

with Foxboro

TELETAX Telemetering

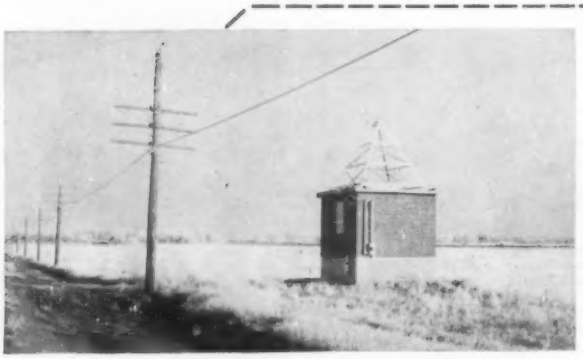
as first step

Foxboro Panel for TELETAX Control of isolated booster pumps is located at main treatment plant of Hoisington, Kansas Water Works. TELETAX Receiver (left) indicates and records storage tank level. Pressure Recorder (right) indicates and records clear-water level. Push buttons and acknowledgement lights are below instruments. *Consulting Engineers: Wilson & Co., Salina, Kansas.*

When you're operating booster pump installations out in the middle of nowhere, transportation costs for personnel can run mighty high. Hoisington, Kansas had that problem until they installed Foxboro TELETAX Telemetering. Now with TELETAX making the 14-mile round trip *electrically*, operators can stay at the main plant and turn the pumps on and off by push button. With TELETAX automatically tied in with other plant control functions, the resulting integrated system is expected to save almost $4000 yearly in operating expenses!

Here's what this modern control system will do — automatically: clearly indicate, record, and regulate level of clearwells and storage tanks; prevent pump operation whenever clearwells are dry or full; alert the operators immediately if line breaks; provide safe, unattended operation round-the-clock during peak demand periods.

Investigate the money-saving, efficiency-boosting advantages of Foxboro Automatic Control for *your* operation. Write for information. **The Foxboro Company, 268 Norfolk St., Foxboro, Mass., U.S.A.**

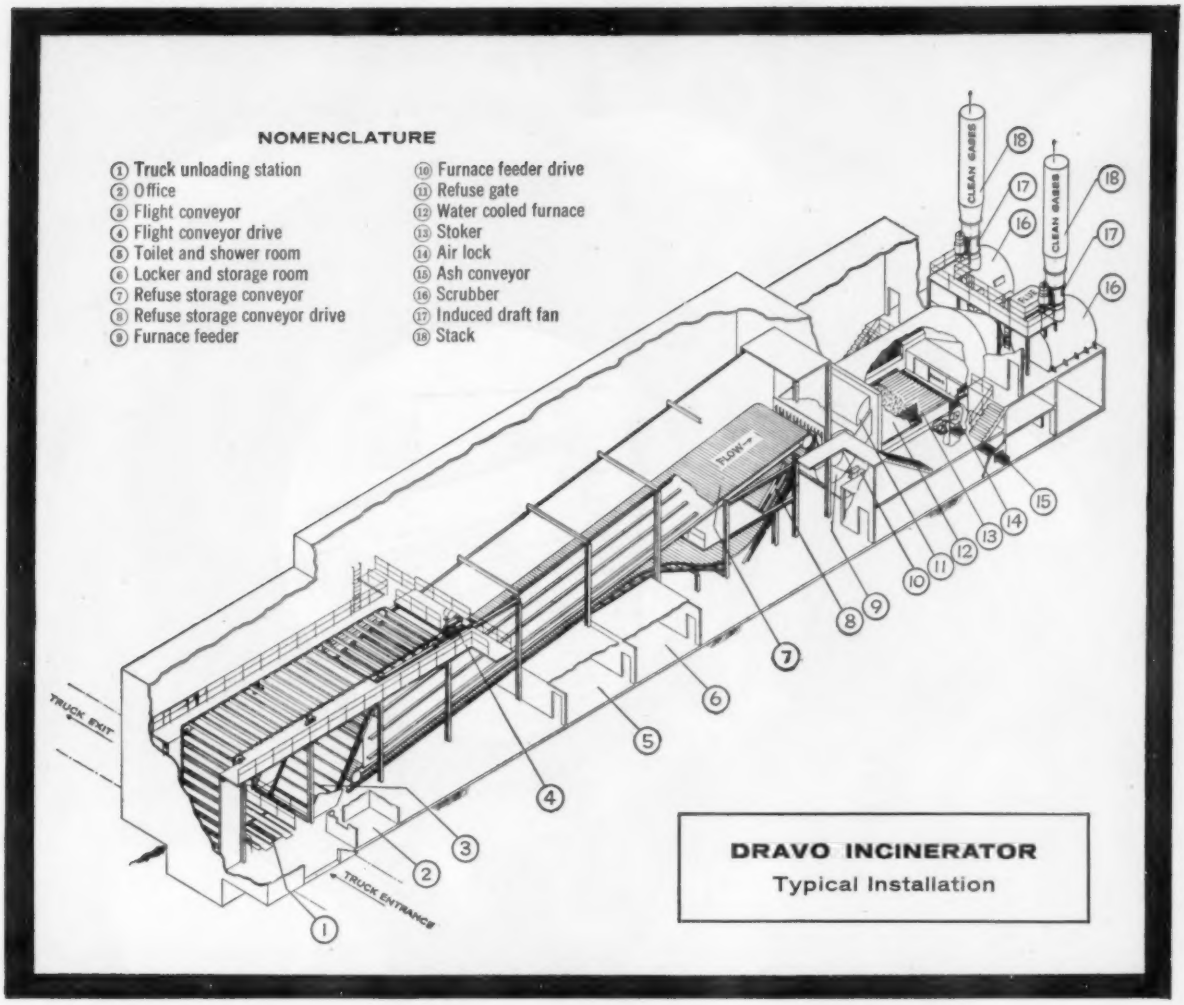


FOXBORO

REG. U.S. PAT OFF.

TELETAX

TELEMETERING



Low first cost—Low operating cost...

DRAVO INCINERATION

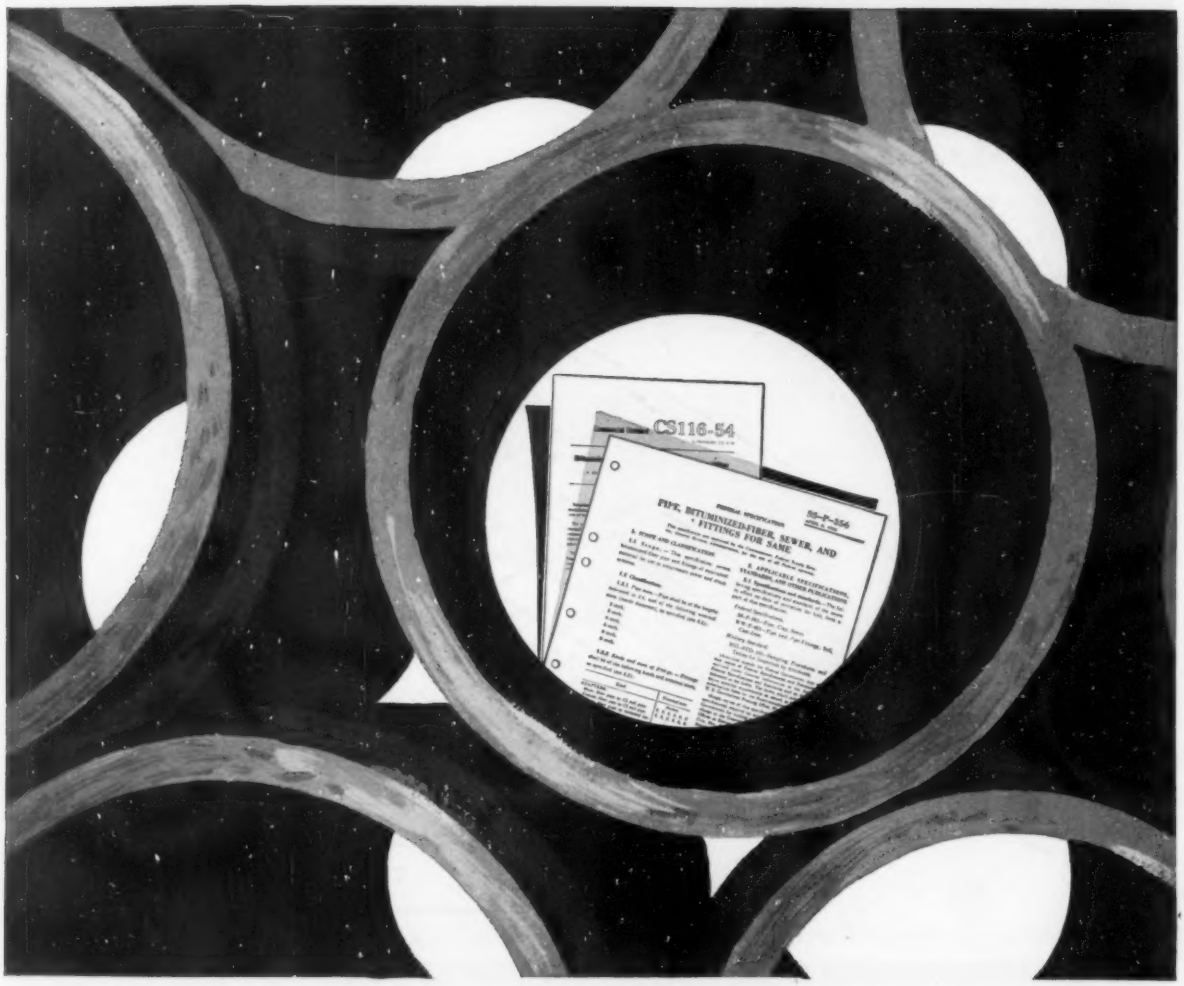
Dravo Incineration is scientifically designed to provide continuous, controlled combustion of all burnable refuse, regardless of moisture content. Combustion is so complete that there is no smoke and no odor. Fly ash discharge from the plant is far below code requirements.

Dravo Incineration is a complete process, including receiving system, automatic refuse handling system, automatic combustion controls, moving grate stoker, wet type flue gas scrubber, residue discharge conveyor and everything necessary for efficient plant operation with minimum personnel.

Dravo Incinerator plants are designed for economical construction and are available in unit sizes from 3 to 40 tons per hour. If yours is among the many communities that are turning to incineration for efficient refuse disposal, it will pay you to learn how Dravo Incineration can save you money in both first cost and operating cost. For complete information, write to DRAVO CORPORATION, DRAVO BUILDING, PITTSBURGH 22, PA.

DRAVO
CORPORATION

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation



BERMICO® Bituminized Fibre Pipe

Exceeds Federal Specifications SS-P-356

Code authorities throughout the country are including Bermico bituminized fibre pipe in their codes because it exceeds Federal Specifications SS-P-356 . . . and passes Commercial Standard CS116-54.

Why it belongs in your code: Bermico, the tough cellulose fibre pipe impregnated with coal tar pitch, resists acids and alkalies, stands up under soil settlement and temperature changes—even boiling water—and provides lasting protection for house-to-septic tank or sewer connections.

Exceeds Federal Government performance requirements for Water Absorption—Crushing Strength—Chemical and Kerosene Resistance—Hot Water Resistance—Heat Resistance—Resistance to Flattening—Beam Strength.

Convenient 8-foot lengths for fast, economical installation—in all diameters from 2″ to 6″. The only bituminized fibre pipe with a full line of fittings—Wyes, Tees, and Bends—of the same material.

Inquire about new full-color movie: "Modern Pipe For Modern Living." Write Dept. BE-8, Brown Company 150 Causeway Street, Boston 14, Mass. (Mills: Berlin, Gorham, North Stratford, N. H.; Corvallis, Ore.)

BERMICO®
for house to sewer or septic tank
BERMISEPTIC®
for septic tank disposal fields

Guarantee of Quality BPI BITUMINOUS PIPE INSTITUTE

Beauty treatment 8ways

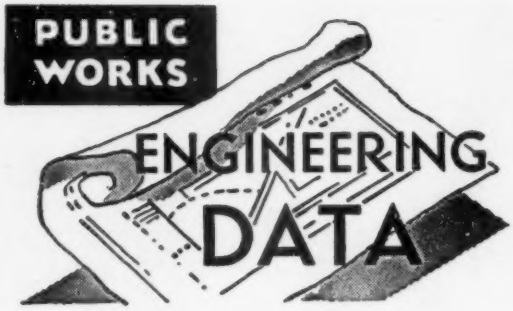
On fine streets everywhere, Monotube Octaflute street lighting poles are outstanding in appearance. This is not the result of merely "folding" metal into an 8-sided pole. The surfaces are actually concave . . . formed by Union Metal's unique cold-rolling method . . . for a decided plus value in attractiveness and clean, uniform taper.

When you're thinking of maximum life and utility, *plus* exceptional appearance, think of Monotube Octaflute poles. They are available in aluminum or steel.

For complete catalog data write to The Union Metal Manufacturing Company, Canton 5, Ohio. In Canada: The Union Metal Manufacturing Company of Canada, Limited, Brampton, Ontario.

UNION METAL

Monotube Poles



Cost of Laying Water Pipe in 1956

As usual, the Division of Water of Toledo, Ohio, in its excellent annual report for 1956, gives an analysis of the costs of laying pipe lines. Based on a breakdown covering more than 15,000 ft. of main, the average cost of 6-inch lines was: For lines less than 500 ft. in length $7.23 per foot; for lines 500 to 1000 ft. long $5.92 per foot; and for lines over 1000 ft. long $5.51 per foot. The distribution of cost is reported as follows: Materials 50.8 percent; pavement restoration and labor 21.62 percent; hauling and equipment 12.4 percent; supervision and overhead 7.1 percent; assessment fees 0.48 percent; and sterilization and engineering 7.6 percent. The average cost of all 6-in. pipe laid was $5.97 per foot. George Van Dorp is chief engineer of the Toledo Water Division.

New Public Works Contract Form Used in Chicago

A new form of contract for Public Works Projects was developed and used by the Public Improvements Division of Chicago, Ill. This form eliminates a cumbersome method of submitting a contract for execution by the successful bidder after notification of an award, and makes the bid document the written contract upon formal acceptance of the bid by the City. It is believed that this new system will eliminate potential arguments that the contract is not exactly the same as the bid description of work and will also procure a performance bond in a shorter time than under the previous system.

Houston Extends Refuse Collection Facilities

With the purchase of 38 new garbage trucks at a cost of $222,377 Houston, Texas, will initiate city garbage collections in newly annexed areas of the city where collections are now being handled by 49 private contractors. The private contractors are costing the citizens about $540,000 a year and estimates are that city forces can get the job done for about $200,000 less per year.

Data on Public Works Costs in Kansas City

For the fiscal year 1955-56, some costs of public works operations for Kansas City, Mo., are given in the excellent annual report of that city, of which L. P. Cookingham is City Manager. These included replacement of 2,887 sq. yds. of concrete pavement at $9.84 per sq. yd.; the backfilling of utility cuts with 1,811 cu. yds. of compacted material at $4.61 per cu. yd.; and replacement of 22,196 sq. yds. of pavement at an average cost of $4.20 per cut.

Maintenance of 942 miles of sewers was carried on by eleven crews; 242,598 ft. of sewers were flushed at 2 cents per lineal foot; and 2,215 emergency

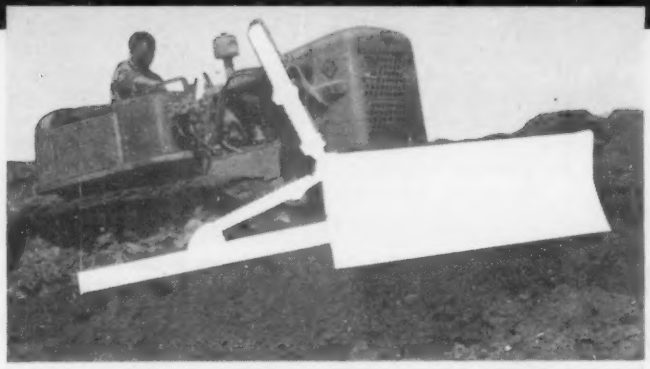
65 belt hp!
up to 15,500 lb drawbar pull!
forward speeds from 1.5 to 5.5 mph!
reverse to 4.1 mph!

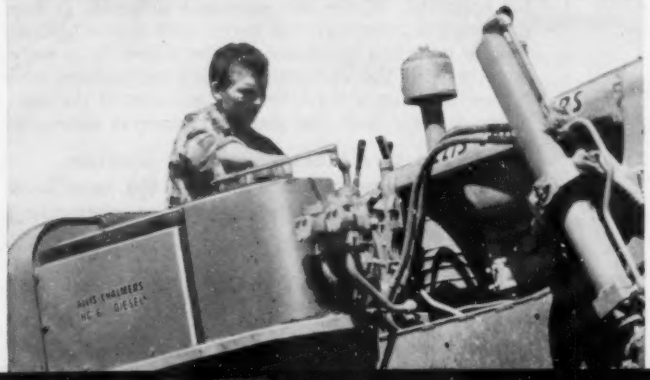
ALLIS-CHALMERS

HD-6

Tractor-Dozer

MORE POWER—BETTER DOZING SPEEDS—BIG-DOZER DESIGN—NEW HANDLING EASE!





Only dozer of its size with these basic advantages . . . engine-mounted rams, long push beams, fewer linkage points (only 2 instead of 5 or 6). These big-dozer features all combine to provide more accurate, gouge-free dozing . . . longer equipment life.

Convenient rotary-valve blade control makes the HD-6 the easiest handling dozer of its size. With more than 5½ feet of track on the ground, it has outstanding flotation . . . yet turns easily in any terrain. The HD-6 also combines large, low-set front idlers with a blade snugged close to the radiator guard . . . to provide balance that means better dozing, more work done under any conditions!

You can <u>see</u> it . . . but there's only one way to <u>prove</u> it—on **your** job!

calls were answered at an average cost of $10.83 per call.

Costs of cleaning streets and alleys were: Cleaning 5,817 street miles in the downtown area at $11.33 per street mile; machine flushing 2,412 miles at $6.39 per mile; machine sweeping 2,844 gutter miles at $5.43; broom gang cleaning, 2,646 miles at $35.36; broom gang rubbish removal, 13,734 cu. yds. at $6.81; alley cleaning, 457 miles at $28.72; leaf removal, 16,598 cu. yds. at $2.72 per yd.; and 5,373 dead animals picked up at an average of $1.08 each.

Driveway Do-it-Yourself Instruction

According to "Public Management", Rockville, Md., provides night-time classes for its do-it-yourself citizens to teach them how to build driveways. The classes are conducted by the city engineer, and 133 persons have enrolled. The city also provides basic plans, inspects the finished work, and provides a dumping area for the excavated dirt. To encourage driveway construction, city crews will break out the curb for a nominal fee. The cost to the home owner who does the work himself is estimated at about one-half of the amount that would be charged by a private contractor. The do-it-yourself estimate is $100 for a solid 20 x 8-foot parking area and $65 for two 20-foot x 18-inch parking strips. This estimate includes breaking out the curb and constructing an apron. A local bank has offered to finance any construction up to $150 per property. It is hoped that the program will encourage enough off-street parking to ease the parking problem in the community.

Details of Stone Base Road Construction

The construction of stone-base roads in Wayne Co., Mich., entails the complete reconstruction of an old, existing gravel road. It involves clearing trees and brush lying within the highway right-of-way, resetting encroaching fences and moving utility poles to proper locations. The road is regraded, culverts are widened, new ditches are constructed and the new road metal is centered. The road between the ditches is constructed 42-feet wide. The center 22 feet is trenched out and two, 4-inch compacted layers of 3-A slag covered with two inches of 22-A gravel are laid in the trench. On plastic soils, an insulating layer of two inches of 30-A slag is placed in the subgrade before the two layers of compacted 3-A slag are placed. This prevents the underlying plastic soil from punching through and filling the voids of the base material to force the aggregate apart and break the keying.

Sidewalks of Distinctive Design

Sidewalks of a distinctive design to harmonize with the architecture of new buildings, where such buildings occupy a block front or large corner, may be permitted in New York City. In these cases, detailed plans of the proposed sidewalks must be submitted for approval. Where the proposed sidewalk is approved, this approval will carry with it the obligation to maintain the design of the sidewalk in conformity with the distinctive design or pattern; and failure to do so will require replacement of the area in its entirety with the standard concrete sidewalk.

Green Bay Plans Municipal Stadium

General obligation bonds for $960,000 have been issued by Green Bay, Wisc., to pay for constructing a municipal stadium.

You can see it, but there's only one way to prove what the HD-6 can do for you!

Call your nearby Allis-Chalmers construction machinery dealer —he'll demonstrate one on your job NOW!

. . . or send us this

Allis-Chalmers
Construction Machinery Division
Milwaukee 1, Wisconsin

Gentlemen:

Please have the Allis-Chalmers construction machinery dealer serving my area arrange a demonstration of the HD-6 tractor-dozer for me.

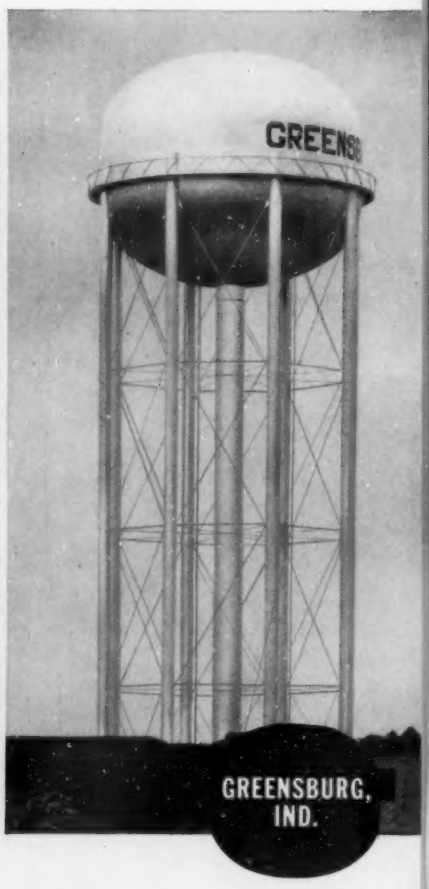
Name_____

Address_____

City_____ State_____

Type of Work_____

50,000 Gallons **150,000 Gallons** **500,000 Gallons**



PITTSBURGH
· DES MOINES
Double
Ellipsoidal
ELEVATED
STEEL TANKS

. . . the capacities to serve your needs
. . . top economy and appearance, too!

Pittsburgh-Des Moines' Double Ellipsoidal Elevated Steel Tanks offer an advantageous combination of economical design and pleasing good looks, meeting today's exacting community standards. With very low head ranges in sizes to 300,000 gallons, and good head ranges up to 750,000 gallons, the Double Ellipsoidal tank design covers at low cost the greater part of all municipal water storage requirements. Write for our illustrated brochure detailing the complete range of PDM elevated tank types and capacities.

PITTSBURGH • DES MOINES STEEL CO.
Plants at PITTSBURGH, DES MOINES, SANTA CLARA, FRESNO, and CADIZ, SPAIN

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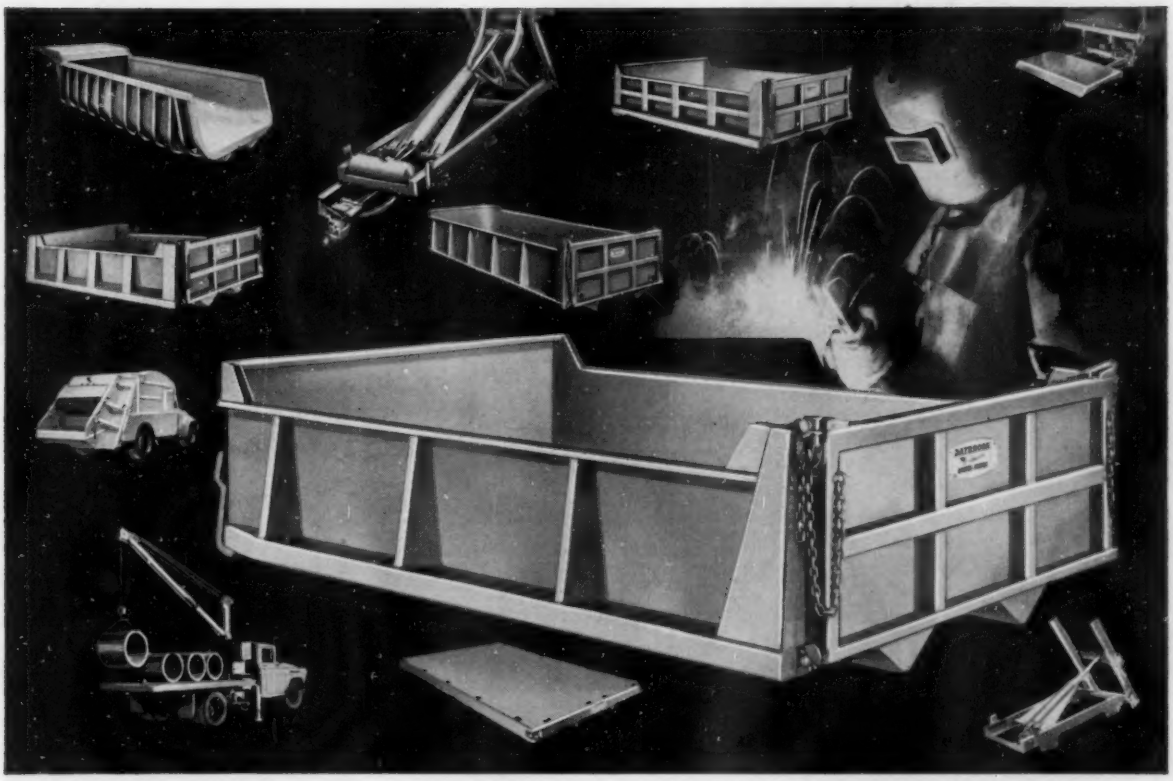
PDM
ELEVATED STEEL TANKS

Type of Work _____

LOOK TO DAYBROOK

...for a New Standard of Workmanship in Truck Equipment for Street or Highway Work!



Daybrook Dump Bodies and Hoists, long a favorite for street and highway work, are now sharing top recognition with other outstanding units of the complete Daybrook line of materials handling equipment for trucks—Power Gates, the Power Loader (truck crane) and Power Packers (refuse bodies).

Today, Daybrook serves municipalities and local and state governments, the world over, in many ways. The dumping of loads for new construction or repair work and the handling of materials on and off trucks speeds up all operations and favors lower costs with speed and greater safety.

If the loading and unloading of trucks for any material, load, or capacity is building up budget problems, then Daybrook can solve them with dependable equipment best suited to the purpose.

You'll like the new Daybrook standard of built-in quality . . . and the economy of longer service life, too!

SEND DAYBROOK LITERATURE CHECKED BELOW: 63

POWER LOADER ☐ POWER PACKER ☐ POWER GATE ☐ DUMP BODY—HOIST ☐

Sign below, attach coupon to letterhead and mail in envelope.

Name _____

DAYBROOK Speedlift® TRUCK EQUIPMENT

DAYBROOK HYDRAULIC DIVISION
L. A. YOUNG SPRING & WIRE CORPORATION
BOWLING GREEN, OHIO

LAYCO

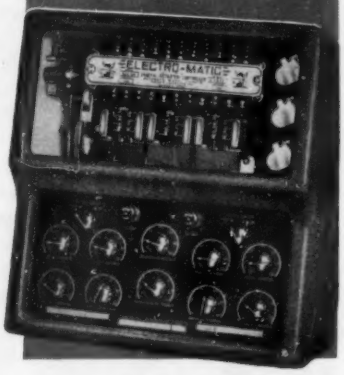
PROTECTING PEDESTRIANS

at school crossings..

at shopping centers..

The touch of a button gives pedestrians WALK protection at intersections with dangerously heavy vehicle traffic. At schools, churches, and shopping centers, Electro-Matic® Controllers and accessory equipment provides safe, efficient solutions to your pedestrian problems.

Electro-Matic Semi-Actuated Model 824DN and Full-Actuated Model 825DN Controllers provide a callable WALK period for the exclusive use of pedestrians, free from all traffic interference.



For details write for Bulletins C-128 and C-130

AUTOMATIC SIGNAL DIVISION

EASTERN INDUSTRIES, INC., NORWALK • CONNECTICUT

POWERS American

SERIES LM-4

"Load-Master"

HYDRAULIC CRANE

Saves time and manpower because it speeds up loading and unloading jobs... handles work normally requiring several specially-equipped vehicles.

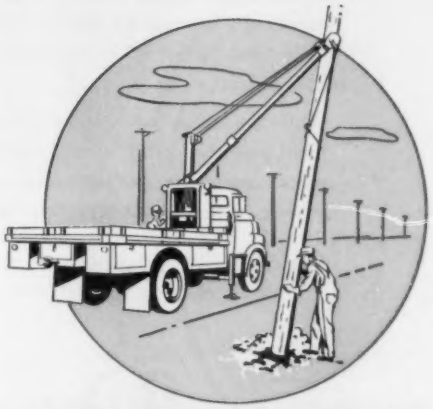
Load-Master lifts a 4000 lb. load with ease... moves it safely and quickly under the most adverse job conditions. Power is derived from a heavy-duty hydraulic pump driven by the truck engine. Controls are located in a position which gives operator full view of the crane at all times.

Operator has absolute control of load at all times. The hydraulic system requires intentional movement of control levers before load position can be changed... and the load cannot drop if the truck engine stalls.

OPERATING FEATURES: Telescopic-type hydraulic boom can be spotted at any point from horizontal position to an 85° angle of elevation; hydraulically-powered mast will turn 360° in either direction; specially-designed winch, driven by a hydraulic motor, is grooved to wind cable evenly; hydraulic outriggers, with swivel-mounted foot plates, furnish extra side stability.

Load-Master is ideally suited for use with the Powers-American Series 300 Body shown above. It can also be furnished with bodies of other types... or shipped for mounting in your shop or local garage.

PRICE INFORMATION AND DESCRIPTIVE LITERATURE WILL BE SENT UPON REQUEST.



Load-Master can be used for setting poles up to 45′ in length. It requires only 20″ of mounting space behind the truck cab. Boom extensions to 22′ can be furnished.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY
ST. LOUIS 15, MO.

•

625 CEDAR STREET
BERKELEY 10, CALIF.

MUNICIPAL YEAR BOOK

The 24th annual volume of the Municipal Year Book is a comprehensive review of municipal government in the United States. The 1957 edition contains 19 major tables with a vast amount of information on the organization, personnel, finances, and activities of cities in the United States. Highlights include special sections on city planning; centralized purchasing; and municipal refuse collection and disposal. The planning section presents data on organization, employees, expenditures, capital budgeting, and use of capital reserve funds. Centralized purchasing data are presented for 708 cities over 10,000 population on purchasing agent, number of employees, amount purchased in 1956, per cent bought locally, pre-qualification of bidders, annual contracts and intergovernmental buying. Refuse collection and disposal data are shown for 865 cities over 5,000 population on storage regulations, enforcement agencies, collection agencies, and refuse disposal methods.

International City Managers' Association, 1313 East 60 Street, Chicago 37; 581 pp.; $10.

EFFECT OF DE-ICING CHLORIDES ON VEHICLES AND PAVEMENTS

This bulletin contains 3 papers presented at the 35th Annual Meeting of the Highway Research Board. The first paper, "Studies of Salt Scaling of Concrete," by George J. Verbeck and Paul Klieger of the Portland Cement Association, presents data confirming work of another investigator that greater amounts of surface scaling occur with intermediate and relatively low concentration of deicers. The second paper, "Effect of De-Icing Salts on the Corrosion of Automobiles," was presented by Ralph J. Wirshing, Research Staff, General Motors Corp. This report gives the result of corrosion of automobiles in a number of cities. The third report, "Curing Requirements for Scale Resistance of Concrete," was presented by Paul Klieger of the Portland Cement As-

WISCONSIN cuts costs with HIGH DENSITY OVERLAID* plywood signs

State's 150,000 signs are maintained by 18 two-man crews; central sign shop is in Madison.

The Traffic Services Section of the State Highway Commission of Wisconsin has experimented with every type of sign material on the market. On the basis of tests and field experience, it is now using considerable amounts of high density overlaid plywood for reflectorized highway signs. The commission cites these three reasons why:

1. Lower cost—Department figures on completed reflectorized signs show high density overlaid plywood enjoys a marked advantage over metal. A 30" overlaid plywood STOP sign for example, costs $1.05 less than 0.081" aluminum.

2. Durability, appearance, vandal resistance—The overlay prevents checking or grain raise, extends useful life of sign. The unpainted sign back surface has a pleasing appearance, and the material seems less subject to vandalism than metal, especially by shooting.

3. Adaptability—Panels can be carried in stock in full sheets and cut to size as needed with inexpensive shop tools. Larger size plywood signs require fewer posts and framing members than comparable sheet metal signs.

OVERLAID FIR PLYWOOD* GIVES YOU THESE ADVANTAGES:

- Combines strength, rigidity and workability of plywood with smooth, durable fused resin-fiber surfaces.
- Great resistance to severe weathering . . . accidents . . . gunshot, bending, other acts of vandalism. No progressive deterioration after damage. Cannot rust or corrode.
- Perfect for long-lasting paint or silk screen finishes. Reflective sheeting may be applied direct to high density overlay, eliminating prime coat.

*OVERLAID PLYWOOD is top-quality DFPA quality-tested Exterior fir plywood (EXT-DFPA®). Two types: (1) High density overlay is hard, glossy; (2) Medium density is opaque, with texture like drawing paper.

DFPA TESTED QUALITY

OVERLAID*

Fir Plywood

MAIL COUPON FOR DETAILED INFORMATION

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Washington, Dept. 140 (Good USA only)
Please send complete application-specification data for overlaid plywood for traffic signs.

Name_____

Firm or Dept._____

Address_____

City_____ Zone_____ State_____

sociation. Data indicate that non-air-entrained concrete is not resistant to scaling and that a minimum curing period is necessary before air-entrained concrete is resistant to scaling. Copies are 75c each and are available from Highway Research Board, 2101 Constitution, Washington, D. C.

SOIL SERIES CEMENT REQUIREMENTS

In early highway soil surveys, identification was based on the concept of taking numerous samples. It was found necessary to develop some system by which broad areas of similar soils could be identified. The U. S. Dept. of Agriculture pedological system of soil series arrangement appeared well suited for identifying soils on an area basis. Because each soil series is a group of soils having soils horizons (layers) similar in characteristics and arrangement and developed from a particular type of parent material, it was believed they should show similar cement requirements for soil-cement construction. Extensive testing of 43 soil series by the authors showed the system to be a reliable indicator of cement requirements for stabilization. Copies are available from Highway Research Board, 2101 Constitution, Washington, D. C. and are 50¢ each.

• • •

Distilling Water for Curacao

Two major distilling units, installed to provide water for Curacao, an island off the north coast of South America, have supplied 1,017,909 cubic meters of water. One unit has run 28,400 hours and the other 26,200 hours without being stopped for cleaning, representing somewhat more than three years of steady service.

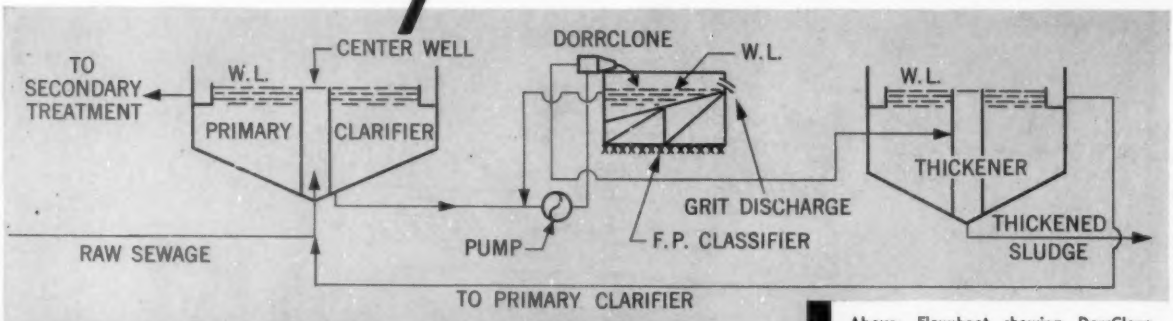
From ground water sources about 311,000 cubic meters of water were obtained. There are 11,441 connections to the water system which has 226.5 kilometers of pipe in service.

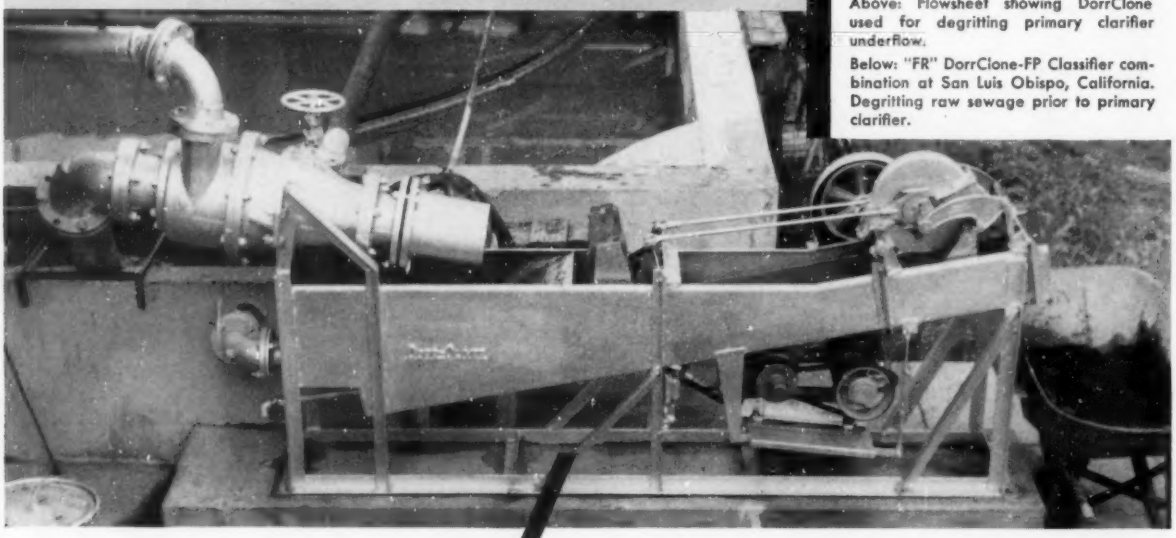
• • •

Equipment for a Sanitary Fill

Handling an average of 2677 cu. yds. of refuse daily, the El Paso, Tex., sanitary fill employs two TD-18 International Tractors with 3-yd. Drott Bull Clams; one HD-11 Allis-Chalmers tractor with a 3-yard Drott; one Le Tourneau D Roadster; and one Allis-Chalmers wheel tractor with a Henry bulldozer. The material deposited during the day is covered by a Bull Clam crew that works at night.

IT'S NEW / It's from DORR-OLIVER





Above: Flowsheet showing DorrClone used for degritting primary clarifier underflow.

Below: "FR" DorrClone-FP Classifier combination at San Luis Obispo, California. Degritting raw sewage prior to primary clarifier.

THE DORRCLONE CLASSIFIER

for degritting sewage

Proven for many years in a wide range of industrial and chemical processing applications, the DorrClone Classifier has now been adapted to the sewage treatment field for removing grit from raw sewage and settled sludge.

Essentially, the DorrClone is a compact cylindro-conical classification unit utilizing centrifugal force in place of gravity. In operation feed enters near the base of the cone tangentially, causing a vortex movement. Centrifugal forces throw the grit to the walls of the cone, where they collect, pass toward the apex, and discharge out of the unit through the apex opening or valve. The lighter grit-free sewage and sludge move to the inner spiral of the vortex where they are displaced into the vortex finder or overflow opening.

Full scale installations have proven that this unit is applicable to the degritting of raw sewage prior to primary sedimentation; the degritting of primary clarifier underflow prior to Densludge Thickening; and the washing of Detritor Collecting Tank discharge.

For more information on the new sewage applications of the DorrClone, write for a copy of Bulletin No. 2508 — just off the press — Dorr-Oliver Incorporated, Stamford, Connecticut.

DorrClone, Densludge, Detritor T.M. Reg. U. S. Pat. Off.

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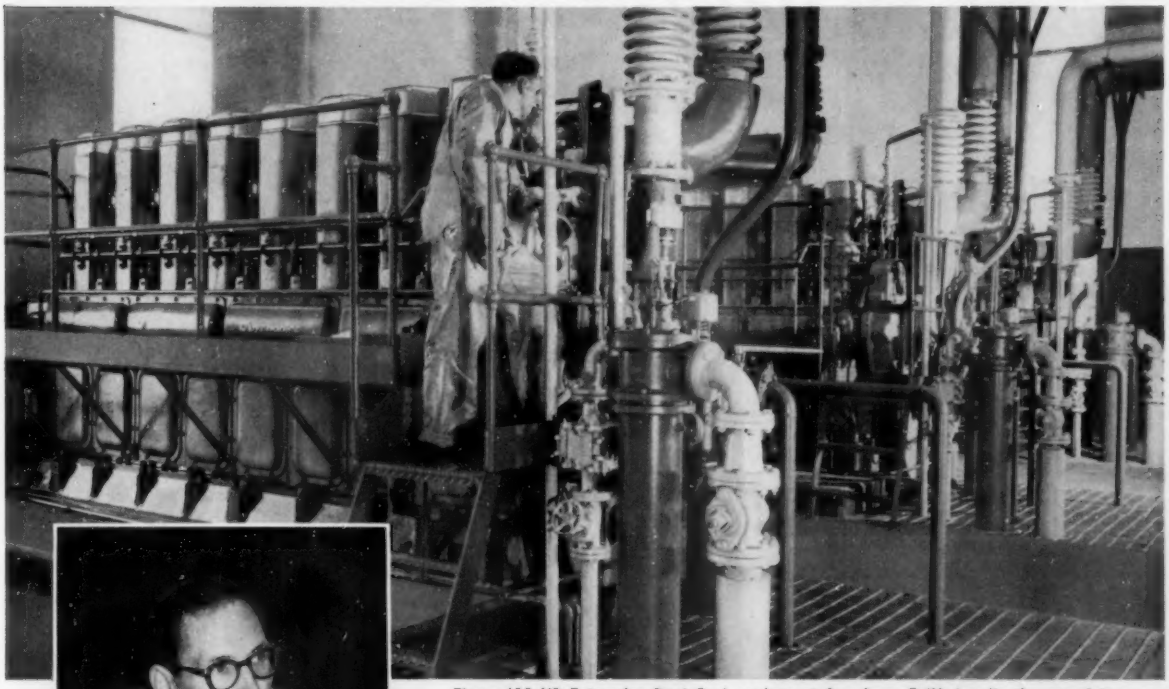
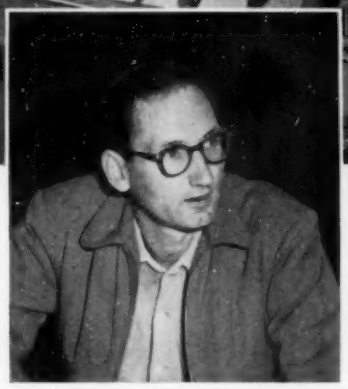
STAMFORD • CONNECTICUT • U.S.A.

Enterprise Engines Run 90% on Free Sewage Gas





Three 625 HP Enterprise Dual Fuel engines at San Jose, Calif. handle the complete power load for all electrical and pumping requirements of this sewage plant.

"Trouble-free and maintenance-free, with very reasonable manpower requirements."

Frank M. Belick

Supt., San Jose, Calif., Sewage Treatment Plant

"We're extremely pleased with the record of efficiency and economy experienced to date with our three Enterprise Engines. They have operated trouble-free and maintenance-free, fitting in exceptionally well with our treatment plant requirements.

"By operating on methane, the sludge gas by-product of sewage treatment, our fuel costs have remained at a minimum. In addition, the Enterprise Dual Fuel 'Select-O-Matic'® feature has given us the flexibility we need when sludge gas production becomes erratic. On either gas or oil the engines respond well to changes in power demands. All in all, these engines provide us the dependable, continuous operation we need with very reasonable manpower requirements."

This and other model sewage plants in such cities as New York, East Boston, Mass., and San Diego, Calif., attest to the fact that complete dependability and economy of municipal operations start with Enterprise Engines.

Engines of Every Type and Size for Every Municipal Need

Enterprise specializes in engines for stationary and portable electric power generation, flood and water pumping systems, and sewage plant power. Versatile fueling is available in diesel, dual fuel and spark ignited gas engines. Models range from 73 to 7703 HP. Call in the Enterprise sales engineer in your area, or contact factory direct for information or help with your plans.

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Be prepared before unexpected storms ice your streets and highways. Eliminate confusion, extra work and accidents by stockpiling Morton Rock Salt now for winter ice and snow removal. Store it in unused buildings, garages, loading platforms or outdoors near key traffic points. You can do this without loss or inconvenience—and, if you wish, a Morton Consulting Engineer will be happy to advise you.

Morton Rock Salt is 8 times better than abrasives. One man and one truckload of Morton Rock Salt does a better job of ice and snow removal than 8 men and 8 loads of abrasives. Morton Rock Salt leaves no messy residue on streets, in gutters and sewers . . . needs no flushing after a thaw . . . won't blow away or leave a rutted, dirty pavement. Non-toxic, Morton Rock Salt also is inexpensive. (It generally costs far less than calcium chloride.)

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☐ *Please send me your free book on ice and snow removal.*

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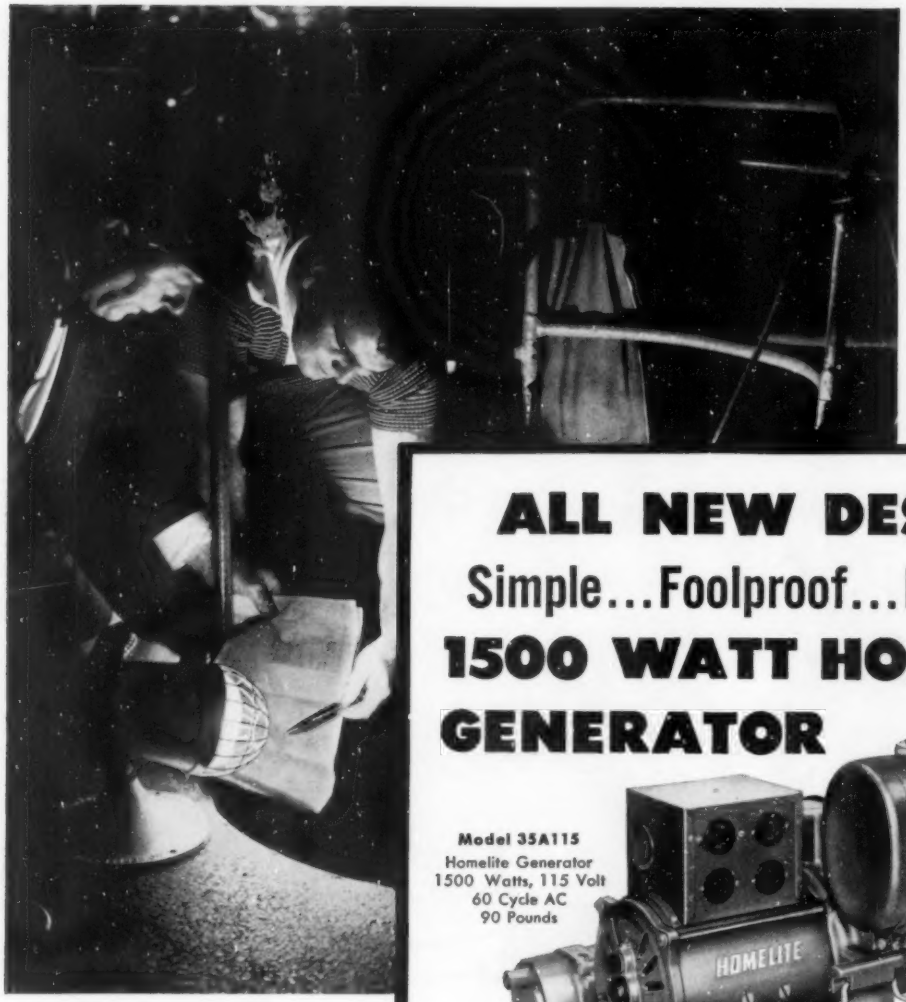

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Homelite Generator
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60 Cycle AC
90 Pounds

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1. New Money-Saving Features . . . No DC brushes; just two easy-to-get-at collector ring brushes . . . No commutator or DC windings . . . No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.

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4. Compact and Lightweight . . . one man can easily carry this generator wherever you need electricity to power time-saving electric tools. No need for long, hazardous power-consuming cables.

Whatever tools you want to operate — electric soldering irons, drills, floodlights, grinders, hammers, the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative.

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn . . . automatically brings engine to full speed when load is applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear . . . increases service life . . . cuts fuel consumption.

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Manufacturers of Carryable PUMPS • GENERATORS • BLOWERS • CHAIN SAWS

LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Dead End

Moore v. City of Columbus, 139 N.E. (2d) 656, an Ohio case decided Feb. 21, 1956, was an action for injuries sustained by a passenger in an automobile which ran into a ditch at the end of a street on a foggy night. The Appellate Court upheld a judgment of the trial court to the effect that the municipality, which had permitted a "dead end" sign to remain in a practically useless condition (i.e. bent over at 45 degrees), and which had failed to erect a barricade at the end of the street terminating in the ditch, had violated a statute requiring the City to keep its streets free from nuisance.

When North and South Collide

City of Austin v. Schmedes, 154 Tex. 416, 279 S.W. (2d) 326, 52 A.L.R. 680, a Texas case decided June 8, 1955, resulted from a collision of automobiles on a city street while a contractor was engaged in street improvement work for the City. Because of the work, the southbound lanes of a divided highway had been barricaded. No signs had been erected by the City or by its contractor directing southbound traffic not to enter the northbound lanes of the highway, or warning northbound traffic to stay out of the left lane of their side of the highway.

It just so happened that Mr. Schmedes was driving north in the northbound left lane and Mr. Anderson was driving south in the Northbound left lane. Neither was visible to the other, because they were on opposite sides of the crest of a hill. Reaching the crest of the hill at the same time, they became *very* visible to each other, but it was too late and they collided.

Schmedes brought suit against both the contractor and the City. The suit against the contractor was dismissed, on the ground that the contractor had no authority or duty to control traffic at a point other than that of the construction itself.

The defense of the City was that, though it had been negligent in failing to erect such signs, it was immune from liability because the control of traffic is a governmental function. This is a very plausible argument indeed. Nevertheless, the general rule is that a municipality is liable if it negligently fails to warn travelers of obstructions and unsafe places in the public way. The present case was held to fall within this general rule, and the City was therefore held liable.

There have been only a few cases of this precise type, but they generally seem to support the present decision. (See 52 A.L.R. (2d) 689).

When is a Dump a Nuisance?

In *Jezowski v. City of Reno,* 286 Pac. (2d) 257, 52, A.L.R. (2d) 1127, a Nevada case decided Aug. 26, 1955, a neighboring property owner sought damages against the City of Reno for the nuisance caused by its operation of the City dump.

The City maintained its dump in a canyon some distance north of the city limits and had operated it for a great number of years before 1946, when the plaintiff acquired her residence property about a mile to the northeast. For many years prior to 1952 the city used the burning method of disposing of waste material. During this period, little control was exercised over the dumping area. The waste material was dumped into a ravine without much effort to confine it to any particular area. Individuals dumping their own refuse would dump it where it was most convenient to them, and such material was not covered. Fire and smoke continuously poured from the dump ground, and papers and trash were blown about by the winds. In

1952, the plaintiff brought a suit similar to the present suit, and was awarded damages of $1000.

After 1952, various changes in the operation of the dump occurred. The City Manager made a study of the dump situation. The present method involves the establishment of a caretaker continuously in charge, who tells people exactly where to dump. A bulldozer pushes the material over the embankment or into a lower section that is being filled. This is then compacted by the bulldozer and a dirt cover is placed over it. A different section in a deep ravine is used for bulky materials such as car bodies, trees, etc. The softer materials, papers, cartons, ashes, etc., are dumped where they can be covered as fast as possible. Some fires inevitably start, mainly through the dumping of hot ashes. This is constantly controlled by the dirt fill. Fencing and gates have been installed, and roads have been blocked, in order to control private dumping.

According to the plaintiff, on July 13, 1953, a big fire started on the dump and cinders and half-burned papers were blowing all over her property. She said that the smoke would blow across their property all the time, that there were fires continuously, that they choked on the smoke, that the smell was horrible, that one could hardly breathe, etc. Photographs and the testimony of neighbors corroborated this.

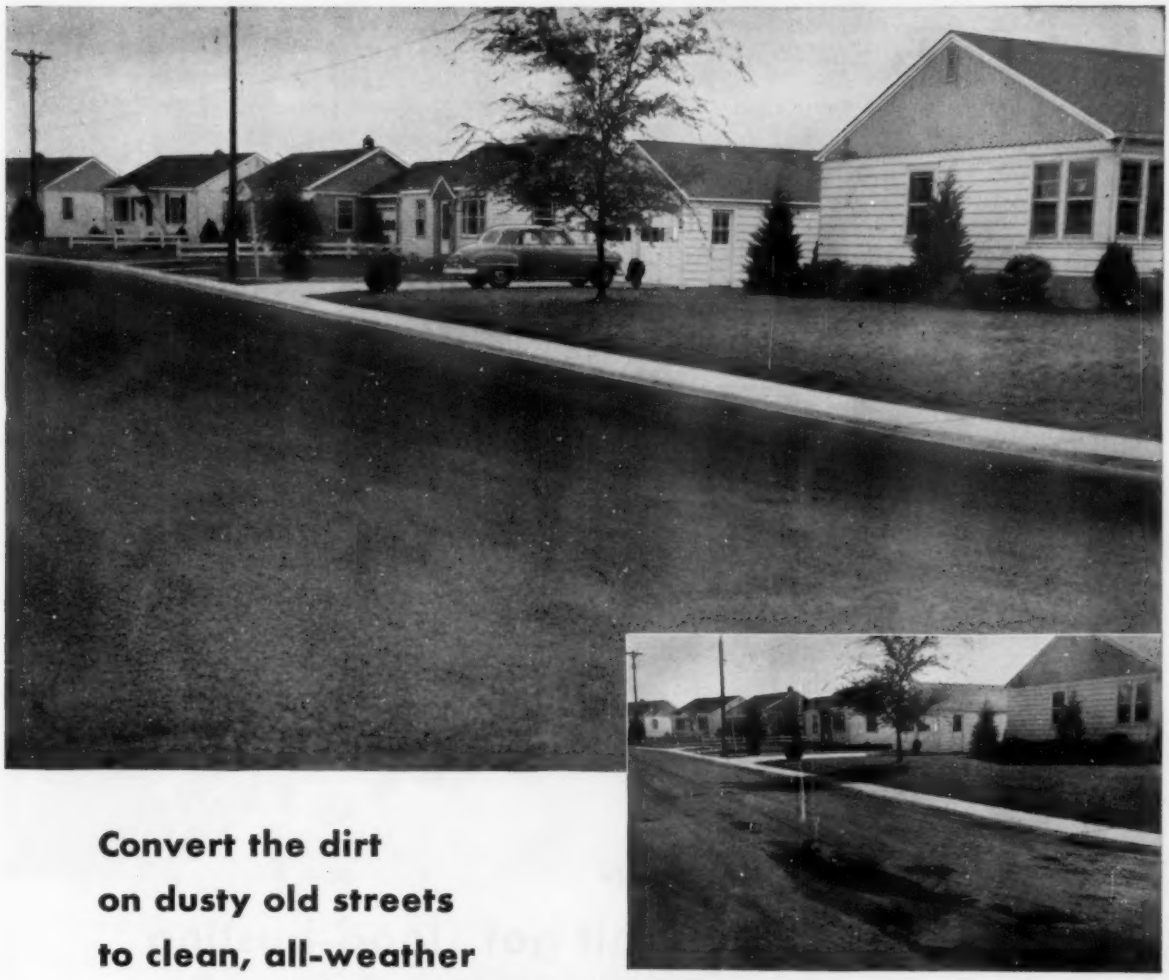
Nevertheless, the jury's verdict was for the City and, on appeal to the Nevada Supreme Court, the decision was affirmed.

As indicated in the annotation in 52 A.L.R. (2d) 1134, it is generally held, as a matter of necessity, that a dump is not a nuisance per se, but can become one as a result of its location or the manner in which it is operated. If a nuisance is established, damages or an injunction abating the nuisance may be granted. In cases at law before a jury, it is generally a question of fact for the jury. In slightly more than half the cases, the dump has been held to be a nuisance.

• • •

Backflow Controls for Honolulu Waterfront

Check valves have been installed on every ship service hydrant along the entire Honolulu waterfront, according to the excellent biennial report of the Board of Water Supply of Honolulu. The program, which involved 151 outlets was started in 1954 and completed in 1956. Cross-connection surveys are now being undertaken.



Convert the dirt on dusty old streets to clean, all-weather pavements with *SOIL-CEMENT*

Dusty, muddy or dangerously potholed streets can be turned easily and quickly into clean, all-weather pavements with soil-cement.* The "before and after" photos above are striking evidence of this transformation.

Usually the scarified granular material of the old street constitutes the "soil" of the new soil-cement base. Since scientific controls were first developed 19 years ago to assure dependable soil-cement performance a long list of materials have been used successfully in soil-cement pavement. These include cinders, clay, caliche, sand, gravel, shale, slag, chat, marl, chert and scoria.

Converting worn-out streets into all-weather soil-cement pavement is quick and easy. Though scientifically controlled, the process is simple and construction and maintenance crews can learn the operations quickly.

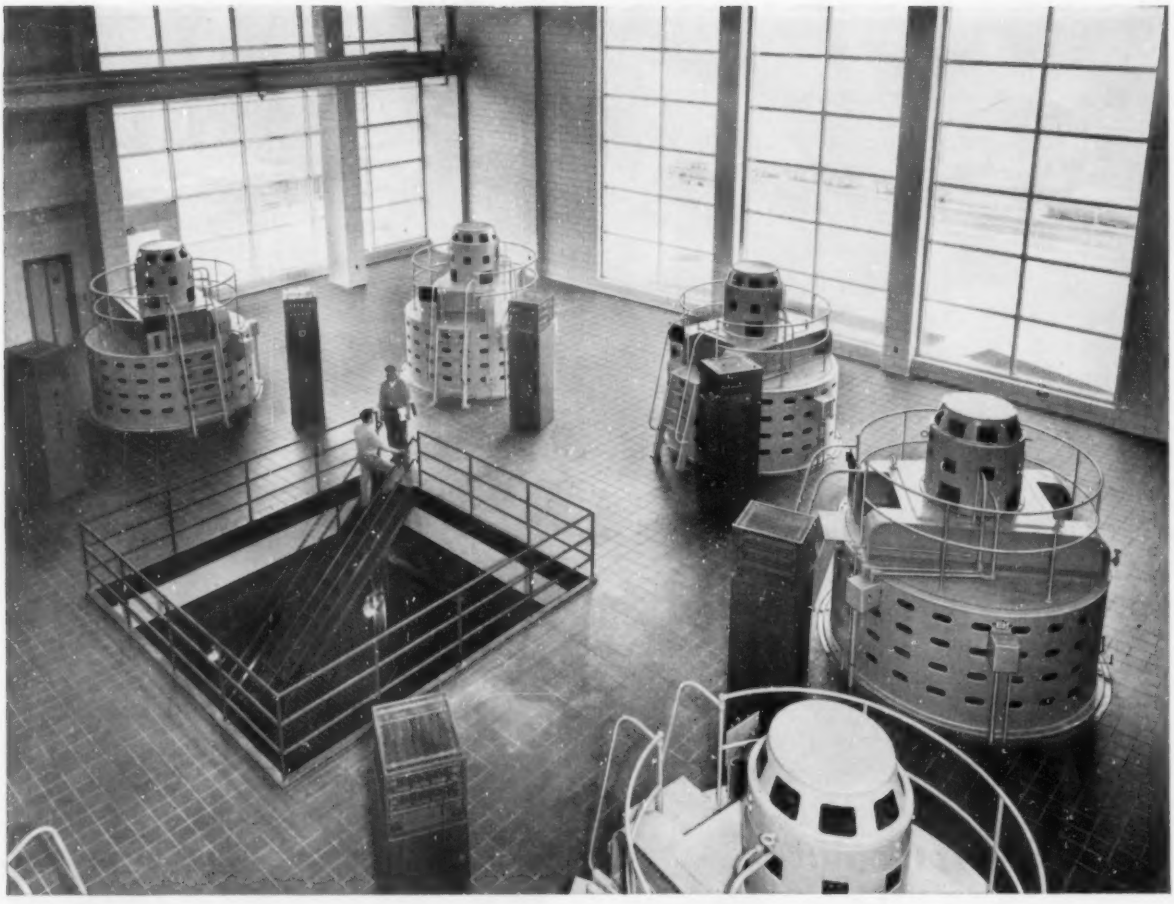
Because paving is fast and simple and because about 85% of the required material usually is soil on the site, soil-cement pavement is economical. It's durable too. Practically all the soil-cement pavement built since 1935 is still serving in all parts of the country under temperatures ranging from 40° below zero to 100° above and under precipitation from arid to more than 60 in. of rainfall per year.

For more information about how to build this low-cost, all-weather pavement for residential streets write for free literature. It is distributed only in the U. S. and Canada.

*Soil-cement pavement consists of soil-cement base and bituminous surface.

PORTLAND CEMENT ASSOCIATION 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work



Here's how Detroit got flood-busting pump power for Storm Water Sewer System

Extensive rainstorm flood damage had been a problem that 150,000 residents of the Fox Creek District of Detroit faced each year. Existing storm sewers and pumping stations were recognized as being inadequate.

To end this situation, Detroit city engineers started a long-range area program. It included the installation of a new large storm water sewer system backed up by a series of pumping stations capable of pumping an enormous quantity of water, *fast!*

Will Handle 30,000 Gallons a Second

The Freud Storm Water Pumping Station shown above is the third to be completed in the new system. Eventually this station will handle up to 30,000 gallons per second with the eight huge pumps installed there.

Eight rugged E-M Vertical Synchronous Motors and Controls are used to drive these huge pumps. Each motor develops 3000 horsepower at 225 rpm.

Here's why E-M Vertical Synchronous Motors were chosen:

1. **HIGH EFFICIENCY** conversion of electric power to mechanical power by synchronous motors . . . results in minimum electric power cost operation.
2. **UNITY POWER FACTOR OPERATION** keeps station power factor high . . . further reducing power costs.
3. **HIGH THRUST CAPACITY DESIGN** frames and bearings . . . assures long-life, trouble-free operation.
4. **ACCESSIBILITY** thru sectional frame design and convenient inspection openings . . . keeps disassembly and inspection costs at a minimum.
5. **SIMPLE STARTING** with "Conscious" Control by the E-M developed Polarized Field-Frequency Relay System.

Ask your nearest E-M sales engineer for vertical motor facts, and write the factory for E-M Synchronizer No. 43, the vertical motor issue.

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Specialists in making motors do **EXACTLY WHAT YOU WANT THEM TO**

Shone Ejectors Operated by Remote Compressed Air Source at Palm Beach

The problem of underground equipment maintenance was skillfully handled by the engineers of the new sewerage system at Palm Beach, Florida. The electrical equipment is housed in centrally located buildings where it is easy to service. The underground sewage lift stations contain only extremely rugged mechanical equipment which requires virtually no maintenance.

The system was engineered by Norman C. Schmid & Associates of Palm Beach and Clifford & Associates of Miami Springs. Malcolm Pirnie & Associates of New York City acted as consultants to the engineers.

Two air compressor stations at ground level furnish power for the 14 sewage lift stations at Palm Beach. Compressed air is piped to the Shone pneumatic ejectors which are located in the underground lift stations. The pneumatic ejectors operate on a mechanical principle which is practically foolproof. Need for maintenance on the valves is very rare. The Shone will even continue to operate perfectly should the entire station be submerged.

The Shone pneumatic ejector is generally recognized as the most trouble-free type of pumping known. Several, which are in operation today, have been giving good service with a minimum of maintenance for over 60 years. One famous Shone was shut into solitary confinement for 20 years. By error it was bricked up and forgotten when the building was remodeled. During the entire period it continued to give faithful service without any maintenance whatsoever.

Free Periodical On Pumping and Sewage Treatment

The Yeomans Guard is a useful publication concerned with pumping materials and the effective treatment of wastes—both domestic and industrial. It is available to you. A copy of the current issue will be sent to you promptly upon request. Contact your local Yeomans representative, listed in the Yellow Pages of your telephone book under "Pumps"—or write Yeomans direct.

BIGGEST PRODUCER in the 1½-yd. class!

New 80 HP tractor-shovel moves up to 40% more yardage per shift!

Most spectacular feature of this new higher-speed 1½-cu. yd. Case-TerraTrac Model 800 crawler is a revolutionary COUNTER-ROTATING Terramatic transmission, that *drives one track forward and the other in reverse — SIMULTANEOUSLY.* Result: Tractor can make fast 360° spin-turns within a track radius of only 5'7" — and still maintain power and traction on both tracks, for moving big loads in mud, or rough terrain.

Instant power-shift, plus constant-mesh gear-train lets operator *change speeds and direction "on-the-go"* — without touching a master clutch, or stopping to shift gears. These exclusive features — combined with *torque-converter drive,* and a new torsion-bar system of track oscillation — give this 80 HP Case-TerraTrac shovel far more power, speed, *and ease of maneuverability* than any other crawler in its price range. New automatic track-roller lubrication cuts greasing time from once a day to several times a year. Call your Case Industrial Dealer now for a free demonstration, or —

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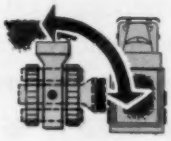
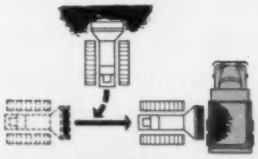
Here's how "Counter-Rotation" pays off in truck loading



With Case-TerraTrac 800 . . . Operator picks up load smoothly . . . flips two hydraulic levers and steps on foot throttle, to spin tractor over a center point into position for dumping, with *one 90° counter-rotating turn.* Then he simply reverses two levers and makes one NON-STOP 90° turn back to pile in seconds. Result: Each cycle is completed with minimum lost time, minimum travel distance, and minimum operator fatigue.



With conventional crawler-loader . . . Operator rams into pile . . . de-clutches . . . hand-shifts into reverse . . . uses hand throttle and brake, to turn and back away. Then he has to de-clutch . . . stop . . . hand-shift and move forward again to dump. What's more, he has to go through the same complicated procedure *in reverse,* to pick up his next load. Result: He usually travels twice as far . . . takes more time to complete each cycle . . . gets twice as tired before end of day . . . just working his hands and feet.

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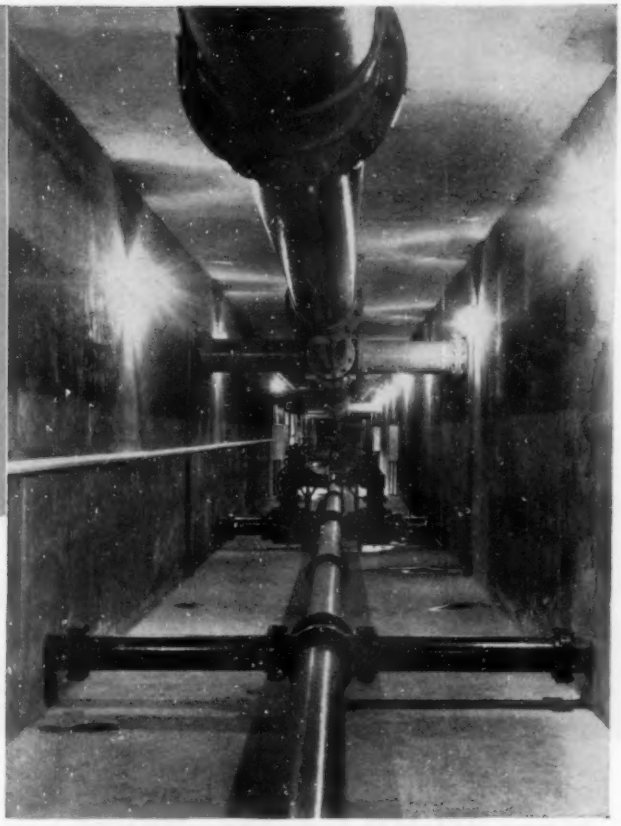

Pipe gallery with sludge suction, scum, and drain piping from primary clarifiers. American Cast Iron Pipe and Fittings.

AMERICAN CAST IRON PIPE

Modern plant design incorporates both efficiency and economy. That's why piping in the $1,500,000 Village Creek Sewage Treatment Plant of Jefferson County, Alabama, is American Cast Iron Pipe.

The high flow capacity, strength, and resistance to corrosion of American Cast Iron Pipe contribute to efficient operation of any modern plant. Its long, trouble-free service life adds the assurance of economy, as well.

Get in touch with your American Cast Iron Pipe Company representative while your new plant or addition to an existing system is in the planning stage. You'll find his up-to-the-minute knowledge of modern methods and materials helpful.

Aeration tank, metering station and primary clarifiers at Village Creek Sewage Treatment Plant, Pratt City, Alabama.

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AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

Lighting Standards and Sign Spans by P & K blend into that pleasant "Florida Look" on the Sunshine State Parkway

An outstanding example of distinctive design and far-sighted planning, the Sunshine State Parkway may well be a model for many future traffic arteries.

From start to finish, the accent was on beauty, safety and economy, generously sprinkled with welcomed originality.

Naturally, modern thinking demanded modern materials. Clean, bright, lightweight and strong P & K aluminum products were specified and installed wherever possible... from lighting standards to over-the-road sign spans. No rust, no painting, high resistance to corrosion... and no maintenance, despite the characteristic sea air of healthful Florida.

Write for the latest P & K catalogs on highway lighting and traffic control products... and use the P & K planning and advisory services without obligation.

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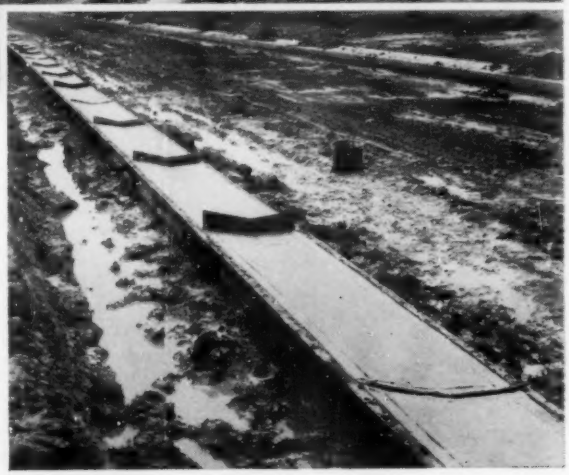
P & K SEAMLESS TAPERED ALUMINUM LIGHTING STANDARDS ARE INSTALLED AT ALL INTERCHANGES AND SERVICE AREAS. P & K SIGN SPANS HELP GUIDE MOTORISTS ALONG ENTIRE PARKWAY.

Why a single investment in Blaw-Knox Universal Forms lets you take on a wider variety of curb and gutter work:



Completely interchangeable

In community street construction you can be faced with form changes that eat away big chunks of your profit. For instance, one job may require different spacing for division plates and your present forms won't work. Blaw-Knox Universal forms are completely interchangeable. Slots for division plates are spaced at one foot intervals, allowing you to tailor the same basic form system to many different jobs.

Save time and money

This basic standardization of form systems makes it easier to calculate the job, set and strip the forms, practically eliminates the necessity for handwork. There's no need for carpentry, no waste of single-use materials. The self-aligning feature eliminates guesswork and reduces the possibility of error.

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Many contractors have used Blaw-Knox Universal forms for ten, even twenty years. They're sturdy enough to take rough handling on job after job, light enough to be moved in a pick-up truck.

A form for every job

Blaw-Knox Universal Forms are available for every type of curb, curb and gutter, integral curb, or sidewalk job from straightaways to the most complicated layouts. See your Blaw-Knox Distributor—he can help you cut time and make more money with the right Blaw-Knox Universal Forms.

BLAW-KNOX

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Construction Equipment Division
43 Charleston Avenue, Mattoon, Illinois

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Delaware River intake to Tidewater Oil Company's refinery near Delaware City, Delaware, is served by this line of Jeffrey traveling water screens.

Three sets of Jeffrey screens—each screen served by a 34,375 gpm/pump—remove floating debris and suspended matter from saline water drawn into the refinery. They are rated at two feet-per-second velocity through clean wire mesh at maximum flow and at minimum water depth.

Controls are manual or automatic. Automatic controls can be set for any differential head loss of from 0″ to 24″ and working at ten to twelve feet in tide variation. Jeffrey sanitation engineers worked with C. F. Braun & Co., Engineers, in planning the installation.

Equipment for preparing and reclaiming water for industrial uses is available from Jeffrey. Our engineers have many years' experience in planning and designing systems for power plant cooling water, pulp and paper process water. Catalog 905 describes this equipment. The Jeffrey Manufacturing Company, 947 North Fourth Street, Columbus 16, Ohio.

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STERLING ROCK SALT, today's most effective and economical ice-control product—shown here protected by Sterling Storite. Salt is loose, easily picked up by a "clamshell."

PUBLIC WORKS Magazine

Vol. 88, No. 8 • August, 1957

ADDITIONAL WATER *for* LITTLE ROCK

IT HAS BEEN apparent for a number of years that an additional water supply of substantial size is needed to take care of the growing demands of Little Rock, Ark. During dry periods, beginning with the summer of 1952, it has been necessary to use the Arkansas River as an auxiliary source of supply. In the summer of 1954, the Arkansas River was used for a period of three months. This water is highly mineral and of a generally unsatisfactory quality.

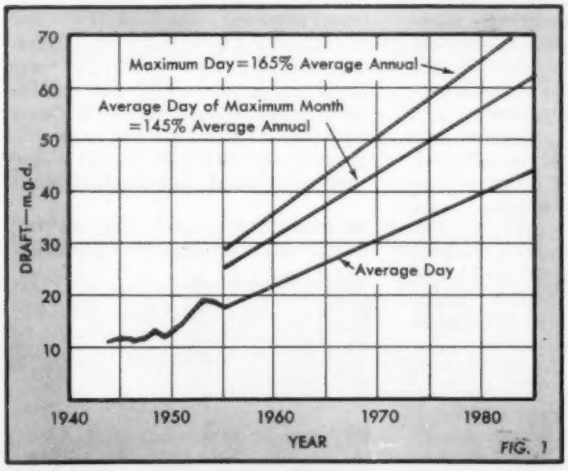
The present source of water supply for Little Rock is Lake Winona which is formed by a dam on Alum Fork Creek, about 35 miles west of the City. The drainage area is 43 square miles, the available storage capacity is 10½ billion gallons and the estimated "dry weather yield" is about 25 mgd. Water flows by gravity from the reservoir to the filter plant which is located on high ground in the westerly part of the City. The supply line is a 39-inch reinforced concrete pipe line which is connected to an equalizing or auxiliary reservoir of 115 million gallons capacity located about 2 miles west of the filter plant. The elevation of this auxiliary reservoir is such that it "floats" on the supply line. Recently a 42-inch second line was constructed from the connection to the auxiliary reservoir to the filter plant.

The transmission capacity from Lake Winona to the filter plant ranges from about 20 to 23 mgd, depending upon the elevation of the reservoir and other factors. In connection with estimates of future needs, the average capacity of this pipe line is assumed to be 22 mgd.

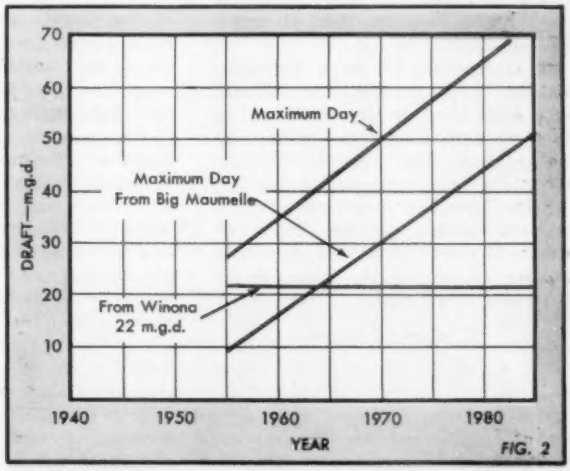
The new project includes a storage reservoir on Big Maumelle River which has a capacity of about 71 billion gallons or 220,000 acre feet and an estimated safe yield of 85 million gallons per day. The reservoir is approximately 11 miles northwest of the City limits of Little Rock. The project includes pumping facilities and appurtenances having a capacity of 50 million gallons per day and a 48-inch concrete pressure line about 9½ miles long The pipe line extends from the pumping station to the existing auxiliary raw water storage reservoir.

Based on past population and water consumption, it is estimated that, in 1980, the Little Rock Water Works will serve a population of 275,000 persons at a per capita rate of 140 gallons per day, or an average consumption of 40 mgd. Maximum monthly averages are estimated at 145 percent of average annual use and maximum daily consumption at about 165 percent, or 66 mgd in 1980. If Little Rock experiences a substantial industrial growth, these figures no doubt will be exceeded.

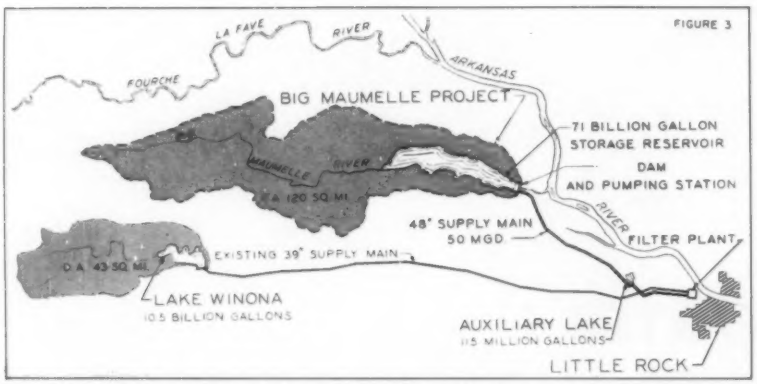
Figure 1 shows past water consumption and estimates of average



● **WATER consumption since 1938, with estimates of annual, average maximum and maximum daily future water use.**



● **FUTURE maximum daily requirements from both of the sources, with amount needed for peak use in the future.**



● **MAP SHOWS locations of the existing Winona Lake reservoir and pipe line and the new Big Maumelle project, including watershed, dam, reservoir and pipe line.**

annual, average maximum and maximum daily future water consumption. As shown on the chart, present day use averages about 20 mgd with daily peaks up to 33 mgd. Figure 2 shows the estimated future maximum daily requirements from both sources and the amount needed from a new source during days of peak consumption, assuming 22 mgd as the average capacity of the pipe line from Lake Winona. These charts were used in estimating future pipe line and pumping capacity which must be provided by the proposed new supply. As shown in Figure 2, a maximum daily rate of about 17 mgd will be needed from the new supply in 1960, 30 mgd in 1970 and 45 mgd in 1980.

Figure 3 shows the relative locations of the proposed Big Maumelle supply, the existing Lake Winona supply and Little Rock. The location of the existing and proposed new pipe lines and relative sizes of the drainage areas and of the reservoirs are also shown. The new dam is located about 11 miles northwest of the City limits of Little Rock, near Pinnacle Peak. At this point the river has a drainage area of about 120 square miles.

It is feasible to store approximately 71 billion gallons, or 220,000 acre feet, of water by constructing an earth dam, 2,200 feet long and 50 feet high at this site. The valley above the dam is unusually flat and the dam provides very large storage capacity at an average depth of about 25 feet. The safe or "dry weather yield" of the reservoir is estimated at 85 mgd.

Design of Dam

An extensive program of rock and soil borings was carried out at the proposed site. Extensive analyses of borrow pit and foundation materials were made to determine their strength, stability and other qualities.

The laboratory tests showed that both embankment materials and upper foundation materials are impervious and that cut-off walls, trenches or sheet piling were unnecessary. They also indicated that the abutment materials consisted of stiff hard clays overlaying impervious shale and that no special abutment cut-off features were required. The amount of water found in the borrow materials was such that compaction could be obtained by standard methods without much change in moisture content. The moisture content of the embankment materials is approximately 25 percent and its maximum dry density is about 100 pounds per cubic foot. Compressive strength tests indicated 2.4 tons per square foot for compacted material and one ton per square foot after saturation.

Consistent with these findings, the dam was designed with an upstream slope of 3 on 1 and a downstream slope of 2½ on 1. There is riprap in the upstream slope and the downstream slope is provided with berms, drains and grassing to prevent erosion. The center portion of the dam is of impervious materials. Filter drains with connecting pipes are under the downstream section of the dam and top and bottom roadways provide access.

Water enters the concrete gate chamber through three 72-inch sluice gates located at different levels. Water may be discharged from the gate house to the pumping station or through 18-inch or 72-inch pivot gates into the 10 x 10-foot concrete diversion conduit which passes under the dam to the stream below. Control of flow will be maintained in the stream below the dam through these gates. The conduit, together with cofferdam works, provides control of water during the construction period.

Materials for the dam were excavated from a borrow pit in the valley above the dam and from the spillway channel. An excellent source of material for rock fill and riprap for the dam was a quarry operated by the contractor on the slope of nearby Pinnacle Peak.

Various alternate spillway sites and designs were considered. A 250-foot long concrete "ogee" spillway section with earth embankment or dike sections on each side, in a long and comparatively wide saddle north of the dam site, was selected as the most economical design. The concrete section has a crest at El. 290 and the flow line of the reservoir will be approximately El. 295 for a 100-year storm, 296 for a 250-year storm and 302 for the maximum probable storm. The top of the earth dikes on each side of the concrete spillway are El. 305 and the top of the dam is El. 310. Therefore, the spillway will take care of the maximum probable storm without overtopping the dike. Even if such a storm should be exceeded, the main dam can not be overtopped and only minor damage to spillway dikes will occur.

Pumping Station and Pipe Line

Thorough studies of capacities for pumping and pipe line facilities were carried out before making a final choice. These indicated a capacity of 50 mgd would be most advantageous and would serve for at least the next 25 years. When needed, these facilities can be doubled at a reasonable cost to provide for the full capacity of the project. In accordance with this criterion, it was determined that the initial pipe line should be 48 inches in diameter and that it should be parallelled with a second line when needed.

A vertical type pump installation with two units of 25 mgd each was found to be the most suitable in view of existing topographic and other conditions. Power problems were given extensive study. Use of internal combustion engines with oil and natural gas fuel was seriously considered. However, it was found that purchased power was most

● **CLEARING reservoir site. An IHC tractor has bird-cage type protection.**

economical under terms of an agreement negotiated with the power company.

The pumping station consists of a cellular concrete structure connected to the intake tower by a 6-foot diameter pipe. The pump discharge outlets and motors of the vertical pumps are mounted on an operating floor 50 x 40 feet in dimension. On this floor will be located the operating mechanism for the sluice gates. Each pump discharge line will have its own surge relief valve which operates only in case of power interruption. At other times operation of cone valves will control excessive water surges.

Two cells of the pumping station substructure will contain large cylindrical well type screens through which water will pass to the pump suction wells. Screens can be backwashed into the diversion conduit as necessary.

The two pumps installed initially will discharge into the 48-inch transmission main through a Venturi type flow meter. Each will have a capacity of 17,500 gpm against a head of 380 feet, and will be driven by a 2,000-horsepower motor. Chlorine may be introduced into the water in the intake chamber if desired.

Plans provide a chlorine building and service building which will house electrical control equipment including reduced voltage starters for the pumps. Provision is made for doubling the capacity of the station in the future by adding the necessary duplicate equipment.

The pipe line will be a 48-inch prestressed embedded steel cylinder concrete line extending from the pumping station to the connection to the existing auxiliary reservoir, a distance of about 9½ miles. The general location of the line is shown in Figure 3.

Development of Project

The Water Works Commissioners considered a number of alternate sources of supply before selecting the Big Maumelle project for development. These included utilization of the Winona supply by diversions from other sources.

In August, 1953, Kenneth W. Lefever and Max A. Mehlburger, Consulting Engineers of Little Rock, submitted a report which proposed obtaining a supply from the Big Maumelle River by constructing a dam in the vicinity of Natural Steps. This project and a number of others were reviewed by Alvord, Burdick and Howson of Chicago in reports prepared in 1954. It was recommended without qualification that the Big Maumelle Project be adopted by the Board.

In December, 1955, the Water Board authorized Kenneth W. Lefever and Max A. Mehlburger of Little Rock and Malcolm Pirnie Engineers of New York City to proceed with detailed surveys and preparation of plans and specifications for the project. Prior to that time aerial topographic surveys of the entire reservoir had been made. The engineering work is being carried out as a joint project under the firm name of Lefever, Mehlburger and Pirnie.

Contracts for rock and soil boring work were let early in 1956 and the firm of Moran, Proctor, Mueser and Rutledge was engaged to make soil analyses and to investigate subsurface conditions.

Detailed design for the dam, spillway and intake structures were completed in June, 1956, and proposals were received from 10 bidders. These ranged from about $1,000,000 to $1,350,000. The low bidder was W. D. Jeffrey Construction Company of Fort Smith, Arkansas at $999,650. This firm has proceeded at a rapid rate with the construction of the earth dam, diversion channel and spillway structures and the work under this contract is nearing completion. W. D. Jeffrey Construction Company also is constructing the substructure of the pumping station.

Bids were received in September, 1956, for the relocation of a portion of a county road near Natural Steps, designated Contract 2. The award was made to W. D. Jeffrey Construction Company, the lowest of three bidders, for $63,000. This project is essentially complete. The contract for reservoir clearing was awarded to Wade Lahar Construction Company, Inc., of Mountain Home, Arkansas, in October, 1956, for $678,000. This involves clearing approximately 9,000 acres of land, about 6,400 of which is covered with timber. The contractor has made satisfactory progress on this work.

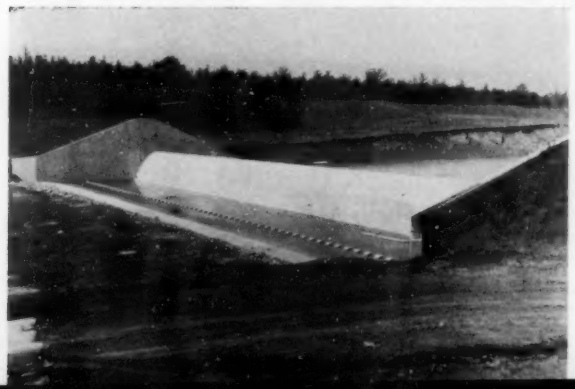
Bids were received for the 48-inch pipe line from the reservoir to the pumping station, the superstructure of the pumping station including pumps and auxiliary equipment, and electrical work for the pumping station last December. The contract for the 48-inch pipe line was awarded to S. E. Evans Construction Company of Fort Smith for $1,773,993; the pumping station contract was awarded to United Construction Company of Memphis, Tennessee, for $548,502; and the electrical contract to Bragg's Electric Construction Company, Inc., of Little Rock, for $80,895.

Alinement surveys have been completed and plans prepared for the necessary relocation of about 6 miles of Arkansas State Highway No. 10. The project also involves relocation of about 10 miles of oil transmission main which extends across portions of the reservoirs.

An agreement was made with the Magnolia Pipe Line Company for replacement of its oil line above the water line of the reservoir. An agreement had also been made with the Arkansas Power and Light Company to construct a high voltage power line to the pumping station and to furnish power for pumping. Both of these agreements were made on terms which are advantageous to the Municipal Water Works.

The total of contracts awarded at the time of writing the report amounted to $4,684,041. Additional contracts to be let were estimated at $1,515,959; and miscellaneous costs at $2,916,270, which included $1,200,000 for the reservoir lands. The total estimated cost is $8,716,270.

● **SPILLWAY of Big Maumelle project is 250 feet long, will carry probable maximum flood without overtopping dikes.**



● **CONSTRUCTION work at the dam site on Big Maumelle River, showing early stages in the concreting operations.**

PREPARATION FOR WINTER MAINTENANCE

This article and the ones following emphasize the need for well engineered and equipped organizations to keep traffic moving on streets and highways and at airports.

The County Engineer and Snow and Ice Control

CURTIS C. COLWELL,

Essex County Engineer and Supervisor of Roads, Newark, N. J.

THE TASK of maintaining a County Highway System is never a matter of dull routine—it is always interesting and yet at times it can be frustrating and aggravating. These latter emotions are most evident in our Northern States when during the winter months ice, snow, freezing rain and frigid slop conspire to foul up the orderly movement of traffic. (The boys from the Southern States may just as well go home at this time and exude sympathy). Essex County, New Jersey, lies within the huge New York metropolitan area and is part of what we might call the Newark sub-division of this area. Newark, itself a city of half a million people, is sufficiently large to exert its own influence on the traffic pattern of Essex County whose total population is one million and of which Newark is the County seat. It lies at the easterly end of the County and to it thousands of motor vehicles travel each morning to return to the suburbs every afternoon.

Essex County covers an area of 125 square miles. The County Highway System has a total length of 195 miles of which 25 miles are on grades that require treatment with the first sign of freezing rain or snow. The most important traffic facilities are the east-west highways where morning and afternoon traffic to and from the City of Newark poses a major problem. These east-west highways average from 20,000 to 35,000 vehicles per day on each highway and 30 percent of this volume is concentrated in the morning and afternoon rush hours. The capacity of these highways is severely tested during these rush hour periods and maximum capacity is based on dry roadways. Anything, therefore, that changes the surface condition of our highways can result only in a slowdown of traffic and temporary congestion.

To minimize the period of slowdown and congestion during icy

● **TRUCKS are lining up under a salt bin for loading. Excellent organization and ample equipment are necessary to meet winter needs of this metropolitan County.**

conditions it is imperative that the Highway Maintenance Division proceed on a highly organized plan of operation in which material, equipment and manpower is used for maximum effectiveness.

It can be readily understood that if the department can receive advance notice of the coming of wintry storms, effective advance measures can be taken to cut down the period of preparation for fighting the elements. Accordingly, the County of Essex annually enters into a contract for the service of Weather Corporation of America, consulting meteorologists. This company pinpoints the time of arrival of approaching storms and weather advisories are sent as often as changes are noted by means of teletype to our Maintenance Headquarters. Such advisories indicate the type of storm, probable duration and probable time of arrival. Upon receipt of such notification, weather advisories are relayed to the municipalities in Essex County by way of the New Jersey State Police Teletype System, through the courtesy and cooperation of Colonel Joseph D. Rutter, Superintendent of State Police.

Prior to our winter season, sand boxes are placed at strategic points throughout the County and stock piles of cinders and salt are placed along mountain roads. These can be used by police and motorists to provide traction when slippery conditions prevail.

The equipment used for screening and plowing consists of 24 sand spreaders on County trucks, 24 spreaders on contractors' trucks, 29 plows on County trucks and 66 plows on contractors' trucks. For manpower there is available 100 County employees plus the drivers and helpers on contractor equipment. Spreading or screening equipment includes: 35 Buddie spreaders; 2 Model E motorized body Highway spreaders; 1 Model E Highway spreader with power takeoff; 6 Model DD Highway motorized tailgate spreaders; 1 Swenson tailgate spreader; and 3 Century tailgate spreaders.

When a storm advisory is received during the working day all normal work is suspended and the County proceeds to prepare trucks by attaching sand spreaders, skid chains and other equipment for a snow-fighting program. At the same time, all screening contractors are alerted to make ready their equipment and report to designated stations to spread de-icing materials on the road. When County trucks and those of the contractors are ready, they are loaded with cinders and salt and assigned to a designated route. The procedure for loading is for each truck in turn to proceed to the stock pile of cinders in the rear of the Maintenance Headquarters where it is loaded with a Haiss bucket loader with swivel discharge conveyor. Each truck in turn then receives rock salt from a salt bin of about 100 tons capacity. Little time is lost in salt loading and each truck proceeds to its route in the field. Screening loads are made up of approximately 65 percent hard coal cinders and 35 percent rock salt. When conditions are unusually severe ⅜ in. broken stone is added to the loads used on the mountains for about 10 percent of the load. In the extreme cold, when icy conditions prevail, a quantity of calcium chloride is added to each load to expedite melting. On occasion loads of rock salt only are spread. Arterial mountain roads and city streets at signalized intersections are given priority. Then the other or less important roads are taken care of wherever there are hills, signalized intersections or bad curves.

If falling snow accumulates to a depth at which cinders are no longer effective, generally 2 inches or more, trucks are released from screening activity and plowing operations are started. All plows, whether County or contract are sent out on pre-assigned routes which cover all roads in the County network. Special attention is given to roads on the mountains where, following plowing, roads are again screened. It should be noted that a man is kept on duty at all times at Maintenance Headquarters and when storm advisories are received outside of working hours, the man on duty alerts County personnel for assembly at Headquarters.

The County maintains 4 jeeps equipped with front push boards and cable connections for pulling stalled cars when they are unable to move under their own power. The procedure for helping a stalled car is for the County Jeep to approach and advise them that the County would be happy to be of service to them if desired. No charge is made. At the same time a card is given them stating "Our services free. Courtesy of Essex County Highway Department". During the winter season of 1956-57 approximately two thousand motorists were aided in this manner. Also during the season the Department used 2000 tons of salt, 4000 c.y. of cinders, 110 tons of ⅜ in. stone and 35 tons of calcium chloride. It may be of interest to note that the Essex County Highway Department operates its own radio communication system. During screening or plowing operations passenger cars, equipped with radio, are dispatched into the field on roving assignments and keep Headquarters advised of progress made.

● **CINDER from stock pile is being loaded into County truck. Such cinder and salt stockpiles are placed at strategic locations in County to expedite control.**

THE PEOPLE DEMAND

Snow Free Roads

Prepared by the Information Section, Missouri State Highway Dept.

A CONTINUALLY growing dependence on the part of the people on automobiles and trucks transport, along with an expansion of the state highway system, has lifted snow removal and ice control to a place among the major maintenance operations of the Missouri State Highway Commission. During 1956, almost $1.5 million of the state's $21.3 million maintenance budget went for that purpose.

Initiated as a convenience to motorists a number of years ago, snow removal and ice control now are regarded by the highway user as essential and expected services of the highway department. At a result, each fall the order now goes out to state highway maintenance workers to keep the state's 29,000 miles of state-maintained highways open to motor vehicles "at all times."

To do this, a force of about 3,000 maintenance workers and more than 1,600 vehicles stands ready to take to the road quickly as the snow flies or ice begins to form. They stay on the job around the clock, in 12-hour shifts, as long as the icing or snow conditions exist and until all roads are clear.

The more than 1,600 vehicles includes approximately: 975 1½-ton to 2-ton conventional trucks to which snow plows are attached or which haul and spread cinders, abrasives or salts; 600 motor graders, some equipped with snow plows and some with both snow plows and wings; 31 two to four-ton 4-wheel drive trucks; one 4-ton conventional truck equipped with cinder bed and snow plow; and one Sno-Go (stationed in the northwest part of the state where heaviest snows are recorded.)

Missouri is a borderline state insofar as weather conditions are concerned. "Unpredictable" is the weather watchword. Thus we must always be prepared for any condition. Normally we make plans for all-out efforts to extend from about Thanksgiving through March. But, we are never surprised when an early storm strikes in late October or a late one in early April. We know also we can expect "anything"—from a thin film of ice, or even only slick bridge floors, to a heavy ice storm or snowstorm blanketing the state; or we may have varying conditions in a half dozen or more areas, and within a few hours. Totaled up, the snow depth would be below most northern tier states, but we equal most of them in the number of days that hazardous conditions exist.

Pattern of the Program

The snow removal and ice control program takes pretty much the same pattern in Missouri each year. Some 300 miles of snow fence are erected at points where it will minimize drifting. Cinder stockpiling is carried on throughout the year, as cinders are available. Because cinders are becoming scarce, limestone chips, sand and by-products from the state's lead and iron mines are stored and used at many points. Calcium chloride and salt are being used more and more, especially in the cities, with 1,137 tons of the former and 2,432 of salt purchased for the past winter.

Stockpiling of abrasive materials is carried on during the summer months while calcium chloride and salt are purchased in the early fall. Abrasive material stockpiles are placed both at central maintenance building points and alongside specific points on the highway where ice and snow create hazards quickly. Calcium chloride is mixed with them as the abrasives are stockpiled to assure they do not freeze. The aim is to have such materials immediately available in any particular area as needed.

Active preparation for the actual snow removal and ice control work, however, is reserved for October. At that time instructions go out to the workers, assignments are made to them of their duties for the winter period, and equipment is readied by affixing snow plow attachments to trucks or putting cinder beds and spreaders in place.

Administration of snow removal and ice control from highways is charged to the Division of Maintenance. This is one of ten divisions and two sections which comprise the Missouri State Highway Department's organizational set-up. The

division and its chief, the engineer of maintenance, have headquarters at the main office of the State Highway Commission in Jefferson City.

The Commission has ten district offices at various points throughout the state. Each district engineer has an assistant in charge of maintenance who is a specialist in that field. Each district will have maintenance crews responsible for the maintenance of state highways within their boundaries. There are a total of about 500 such crews in the state, with the individual crews ranging from two to a dozen men or more and averaging about three men to the crew. The 72 foremen who supervise the work of these crews are the men who actually control the snow and ice.

Weather forecasts and radio play only a small part in Missouri snow removal and ice control operations. Our District 4 (Kansas City) and District 6 (Kirkwood, for St. Louis Metropolitan area) have two-way radio facilities and use them within a radius of about 40 miles of the district offices. As for weather forecasts, our employees watch them for any special signs they need to be alert, but for the most part they have specific instructions on when to report as a storm begins or are reached by telephone if any emergency arises during the night.

The Job to Do

The first active move in the fall, of course, is distribution to the maintenance workers of their assignments for the winter period, and the setting up of a priority schedule as to the order in which roads will be cleared.

Under minimum snow or icing conditions the individual maintenance crews will take care of the roads which they regularly maintain. That mileage ranges from 50 to 80 miles per crew, on the average, with some having more and a few having less. In periods of heavy snow or ice conditions, extra crews are added or crews brought in from adjoining areas which were not affected by the storm.

Maintenance crews are instructed to clear snow or ice first from the U. S. marked arterial routes in their area. Next, when those are open, they move to the more heavily traveled Missouri-marked primary system highways. Then they turn to the most heavily traveled supplementary routes and finally to the least-traveled state-maintained road. The 24-hour work schedule remains in effect until the federal and state routes are opened for two-way traffic and supplementary roads for one-way.

With instructions issued to the workers, the first order of business in the fall is erecting snow fence. Proper location and maintenance of such fence is important and careful study of topography, including natural and artificial snow barriers, is necessary to assure maximum efficiency in placement. It should be noted that rotation of farm crops changes fence location needs from year to year.

Usually, our fence is set about 60 to 100 feet from the center line of the road, and parallel to it. The distance is largely controlled by the slope of the natural ground in the immediate area. In a few cases, on north and south routes, good results are obtained by setting 50-foot sections at about 45 degree angles to the roadway. Our snow fence generally is erected on private property, with consent of the owner, and we put it up and take it down at times when it will least inconvenience the owner.

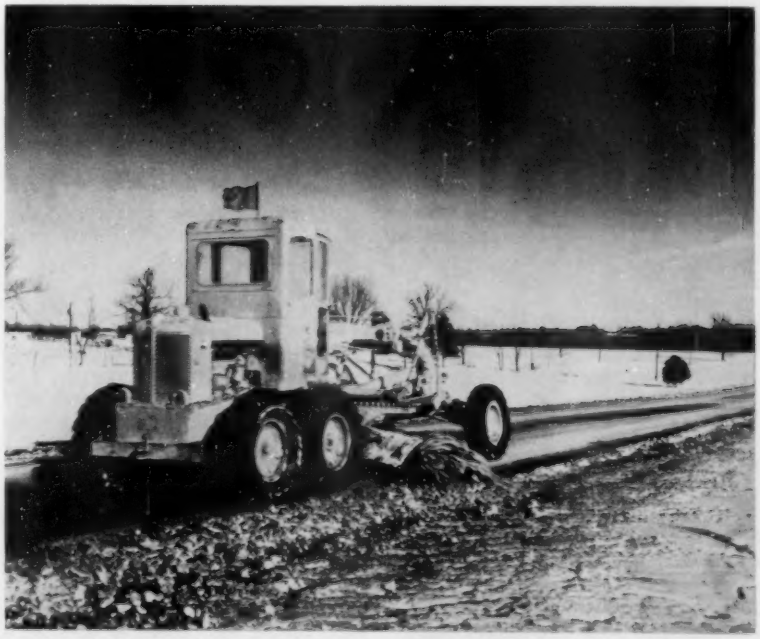
Snow fence can be erected at a lower cost by using trucks with flat beds, or by constructing a rack on a dump bed. Posts should be driven into the ground on 10-foot spacings and at uniform heights, to add to the general well-kept appearance of the fence.

With snow fence up, trucks used by the special snow crews are shifted to their winter headquarters in late October or early November. All 1½ and 2-ton trucks are equipped with one-way plows; two-ton and larger have V-plows. Each unit carries an extra fan belt, light bulbs, fuses and a roll of tape. Also, they have scoops, extra motor oil, flashers, Toledo torches, tire chains, tow chains, and snow plow shoes as needed to meet most any emergency. In some instances they also carry an extra barrel of gasoline and every piece of snow-removal equipment is equipped with a flashing blue light to warn motorists such equipment is at work.

Actual snow removal work is divided into two classes, heavy and light. Light snow is removed by one-way plows and motor graders. The crews start work as soon as the snow starts falling and attempt to remove it before it becomes packed on the pavement. They stay at their job until the snow is off the pavement and shoulders, spillways are open and bridge floors cleaned.

Heavy snow operation starts the same way as light snow, but with heavy equipment pressed into operation as needed. After heavy equipment is pressed into service the one-way snow plows merely work cleaning the pavement and assisting the heavy units as needed.

In Missouri, snow is always plowed away from the direction from which the snow is coming, to avoid windrows on the storm side of the roadway which might cause excessive drifting.



● **ICE CONTROL—A motor grader is chipping ice from US 40 in Boone County, Mo. Blurred effect in picture is caused by vibration of equipment as it moves the ice.**

● **HAND** shovel can still be an important item. Here ice and snow are being cleared from Bagnall Dam roadway.

● **SNOW FENCE** erection along U. S. 40, near California, Mo., is a start on the ice control and snow removal program.

● **RUGGED** work: Maintenance man has replenished, at midnight, his load of cinder and is about to start out again. Scene is not far from Jefferson City, Route 50.

The snow removal job in any storm is never considered complete until all snow has been removed from the shoulder, spillways opened and pavement and bridge floors cleaned. Opening of spillways is considered especially important to prevent ponding of water on pavements during thaws.

Ice Control Details

It is not unusual in Missouri to have highways in several counties blanketed with a sheet of ice; nor is it unusual to have a spotted icy condition scattered over an entire district. The most widely used abrasives are cinders, sand, limestone chips and lead mine by-products. Cinders are becoming increasingly scarce but, when they can be obtained, they are quite desirable because of their color and effect in that the traveling public can see them and know the highway crew has been on the job.

As soon as the ice begins to form on pavements, trucks are on the road to treat the sharpest curves, hills, railroad crossings, junctions, bridges and congested areas. This will keep traffic moving and give protection at the most dangerous points. On gravel roadways with windrows surfacing material sometimes is spread over the ice and gives fair protection.

When the temperature remains below freezing day and night for several days, the abrasive materials and tire chains begin to cause deterioration of the ice. Then, as soon as a thaw appears, every piece of equipment with a cutting edge is placed on the road. Each time a blade passes over the roadway the ice is thinned and the general public is encouraged because of the effort being made.

While it doesn't come under the term of snow removal and ice control, the Missouri Commission does offer one other service to the highway user during snow and ice periods. Through our Information Section special bulletins are issued twice each day on highway conditions throughout the state as storm periods require.

The individual maintenance man on stated arterial highways reports to his maintenance foreman in early morning and early afternoon on the condition of his road. That information in turn is given to the district office, the State Highway Patrol, and the Highway Commission's Main Office, where it is prepared for publication and distributed immediately to the news services and radio and television stations.

Final cost figures for the recent winter had not been compiled when this article was prepared. However, for the 1955-56 winter period snow removal and ice control cost $1,452,-236.62. This compared with $541,698 for the 1949-50 winter.

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Still in a Fog About Fog Machines

About three years ago fog-dispelling machines were installed to combat fog conditions at the northern end of the New Jersey Turnpike. It has been found that, under the conditions existing in this area, the machines will not disperse a general fog. Fog pockets and localized smog conditions, for which the machines were designed, have not occurred sufficiently often for a full test.

Night Patrol Operation...

GUY E. NICHOLAS,
Director,
Division of Special Services,
Maine State Highway Commission

THE NIGHT patrol of the Maine State Highway Commission has completed its third winter of operation, thus terminating another period of aiding motorists who find it necessary to make use of the State's highways during the hours between darkness and daylight.

This patrol, officially started in 1954 on the recommendation of Highway Commission Chairman, David H. Stevens, for the safety and convenience of the motoring public, has been most appreciated. Twenty-eight light trucks operating out of all six of the Highway Divisions, 84 patrolmen and 18 radiomen keep a watchful eye on some 1700 miles of the State's most heavily traveled highways.

Commencing about the middle of November and ending the first of April, the night patrol travels over 3500 miles nightly reporting every hour, by two-way radio, weather and road conditions to the division offices. The data is then dispatched to the Augusta office where it is available for distribution to the State Police, news services and general public. This constant check on the weather and road conditions is the most important function of the night patrol. When it starts snowing or if the surface of the road should become slippery, the patrolmen sends out an alert over his mobile radio to the division headquarters. The radio operator at the office in turn telephones the crews of the plows and sand trucks and directs them to go where they are needed. The patrolman personally takes care of small icy spots with sand from his truck.

● **NIGHT patrolmen report weather and road conditions every hour to the divisional offices, using 2-way radio.**

Radio communication is essential to the rapid dispatching of the snow and ice control equipment. The Commission has a state-wide radio system consisting of 13 base stations and 124 mobile units which go into service when a storm strikes.

The patrol trucks carry emergency equipment which includes: a flashlight, axe, two shovels, a tow chain, can of gasoline, four torches, one spot light and a quantity of sand.

Many Special Services

In addition to their regular duties, they are frequently called upon to assist motorists in distress. It is not uncommon for a patrolman to supply a small quantity of gasoline, haul a car back on the highway that has gone off the road (providing they sign a release waiving all claims for damage by the owner of the car), or contact a garage for purpose of towing or making repairs. No gratuity is expected or permitted for any of the services performed.

There have been occasions where patrolmen discovered fatal accidents and fires in remote areas. One patrolman assisted in transporting a maternity case to the hospital with only minutes to spare. Another obtained a doctor and ambulance for a man suffering from a heart attack, and still another rounded up a run-away pony.

So, it is with little wonder that Maine people have learned to respect the little orange pick-up trucks with the flashing red light atop the cabs. They know that the operators of these units are keeping a constant vigil throughout the night, patrolling the most traveled highways, and contributing to the safety and convenience of the nighttime motorists.

● **MOTOR grader operator is being given instructions relayed by radio from the division office by the night patrol.**

● **RESCUE operations: Carload of women and children discovered by night patrol and helped back into the roadway.**

PARTS OF THE SOUTH HAVE

LOUIS WASHER, JR.,
Chief of Operations,
Department of Public Works,
Richmond, Virginia

COMPARED to northern cities, Richmond, Va., does not have much ice and snow. However, the problems resulting from frozen and slick streets are similar to those of most other cities. Since Richmond is located on many hills and knolls with grades ranging up to 13 percent, we have traffic problems when the streets and bridges glaze over in cold weather. We have 560 miles of paved streets and approximately 175 bridges, culverts and overpasses, each one a problem to keep treated with abrasives and chloride in addition to the many miles of paved streets.

Because Richmond does not get an abnormal amount of snow it means that we must use our regular forces of street cleaners, refuse collectors and maintenance men in this program. Due to the geographical location of Richmond, it is extremely difficult for the Weather Bureau to predict snow and ice accurately. This, of course, proves expensive. For instance, when we receive what seems to be a firm prediction of freezing rain or snow, we must prepare for the emergency which means loading trucks with sand and mounting 10 sand spreaders and 14 chemical spreaders in order to move quickly if the prediction materializes.

If this happens at night, on weekends or holidays it means that we must get men from their homes as quickly as possible to man equipment, put on chains, handle complaints on both radio and telephones and ride the streets in cars equipped with radios to report dangerous conditions or traffic jams.

Another problem arises when the men are called out at night, since they must work on their regular assignments the next day and make scheduled collections of trash and garbage.

We feel that Richmond's snow and ice control program, in general, functions very well and with a minimum of inconvenience to the public. However, our average drivers could use considerable training in driving under such adverse conditions.

The Department of Public Works has prepared an emergency organization plan for snow and ice removal whose primary objective is to keep traffic, automotive and pedestrian, moving safely. The Weather Bureau and Police Radio maintain close coordination with our key personnel during the sleet and snow season. There is a standing order by which such key personnel are to be notified, whether during or after office hours. Key personnel, in turn, notify supervisory personnel in charge of the programs which will probably be activated. Supervisory personnel in their turn notify assigned foremen who have lists of operating personnel to call to duty.

Chemical Treatment

As soon as icing conditions become apparent, our chemical treatment program is placed in effect. The 14 Tarco chemical spreaders and 10 sand spreaders are utilized to the fullest extent possible. As soon as icing conditions develop or a firm prediction of snow is made, men and equipment are called to handle the bridges.

Flushers are put into operation only on instructions from the superintendent of flushing. Each opera-

● **ICE AND SNOW are not frequent in Richmond, but there are problems on the many hills and 175 bridges and overpasses.**

tor is given a route to cover continually until further instructions. He is to proceed over his route at a moderate speed and wash the snow toward the gutters with sufficient flow of water to carry it to sewer inlets. Flushing is not done when the temperature is below 26 degrees. All bridges treated with chemicals are thoroughly flushed as soon as the temperature permits.

Responsibility for Plowing

Plowing does not begin until the snow reaches a depth of four inches. The superintendent of snow plowing is responsible for the time of starting the plows and individual crews are put in operation as they become ready. The ballast for snow plowing trucks is sand, furnished and loaded by the Division of Street Maintenance. After receiving ballast, plows and chains, each truck stands by for orders to start plowing. All plowing throws snow to the right except where there is a plot in the center of the street. Then the blade may be shifted to plow the snow right or left.

In case of emergency and where field equipment cannot reach the base of operations at the fairgrounds, the fire chief has approved use of the gasoline facilities at six fire houses in different parts of the city.

In the central business district and in business areas where white wings are not assigned, gangs supplement the present 16 white wings in removing snow from cross walks. These crews are assigned by the superintendent of chemical treatment as needed and come from reserve personnel in the various bureaus. Chemicals are spread on all crosswalks in the white wing territories.

Other Supervisory Duties

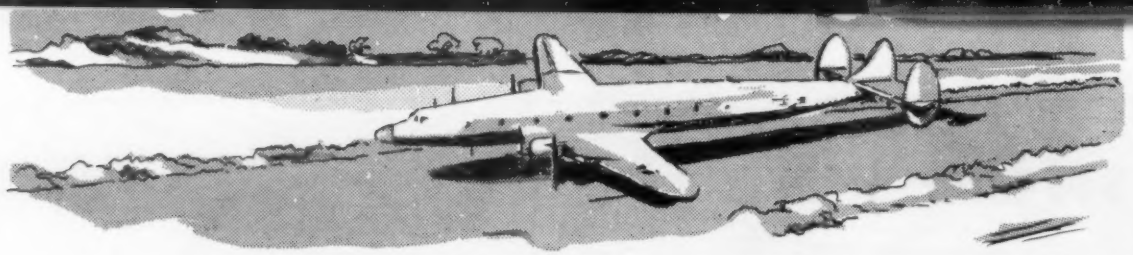
The Division of Sewer Maintenance is activated as soon as it becomes apparent to the supervisor that clogging of basins is liable to result either from snow or sleet or from the use of flushers. The engineer in charge of hired equipment is contacted whenever it is necessary to hire equipment for use in emergency. Time for rental of such equipment is kept on an approved DPW form. Types of equipment hired include trucks, front end loaders and motor patrols. Seventeen snow disposal areas are designed in various parts of the city.

The supervisor of chemical and sand treatment is required to keep a log of events to include all weather reports, men called out, equipment called, crews dispatched and chemicals and sand used. The log must be as complete as possible and kept in a special ledger. After the emergency, it is copied for the files.

In our program booklet for "Emergency Organization" different colored sections indicate the sections on the chemical treatment program, sand treatment routes, snow plowing and snow removal by mechanical loaders, so that it is possible to turn to the right pages quickly for personnel and procedures.

Although ice and snow removal is not a frequent problem in a city as far south as Richmond, we have to be prepared even though in such a climate it may seem that we may have to keep on hand a pound of prevention for an ounce of cure. But when the ice and snow do come, they can disrupt the movements of the city, sometimes even more drastically than in places where such conditions are more usual. It is for that reason that the Department of Public Works has worked out this plan for all-out mobilization against snow and ice whenever they come to Richmond.

● **CHEMICAL treatment program starts as soon as icing conditions are reported. Calcium chloride is being loaded at warehouse.**



CLEAN RUNWAYS···
A Must for the Air Age

FRANCIS A. BOLTON,
Superintendent,
Port Columbus,
Columbus, Ohio

THE AIR age is rapidly leaving weather behind—with two important exceptions. Modern planes fly above and around storms. Passengers ride in smooth comfort while the elements lash those left on the ground. But every plane is tied to the earth at two points—the point of departure and the field where it eventually lands.

The advent of the jet plane has made these two points more and more important. The modern jet burns fuel at a tremendous rate. Being assured that the field is in good operational shape becomes even more important in the jet age. The airport at the destination must provide a suitable landing strip at all times. Snow and ice control must be maintained if we operators are going to be a part of a safe, dependable transportation system.

While an airport operator has no control over weather conditions, he does have important control over the effect of those conditions on the runways, taxiways and parking ramps. And as jet planes have made it imperative that runways be kept open, it has also made it more important that they be in very good condition. Jet airplanes land faster than propeller driven airplanes. Faster fighter planes have narrow tires, made to fold into narrower wings to give additional speed. That means planes land at higher speeds and with less braking area in contact with the ground. The runway the plane touches has to provide the grip to stop it.

Jets, too, depend almost entirely on their contact with the ground as a basis for deceleration and the safe completion of a landing. They are very streamlined. There is no windmilling action of a propeller to slow them. The new jet airliners, however, will be equipped with reversing mechanism which will be most helpful.

Only a few of the faster and heavier military jets have drag parachutes to provide some slowing action other than that caused by tires and brakes. A patch of ice and snow can be disastrous. Good braking conditions, of course, are important to all planes. I mention jets especially because of their special problems. Piston engine planes land slower than the jets. The modern ones can obtain braking action by reversing the pitch of their propellers.

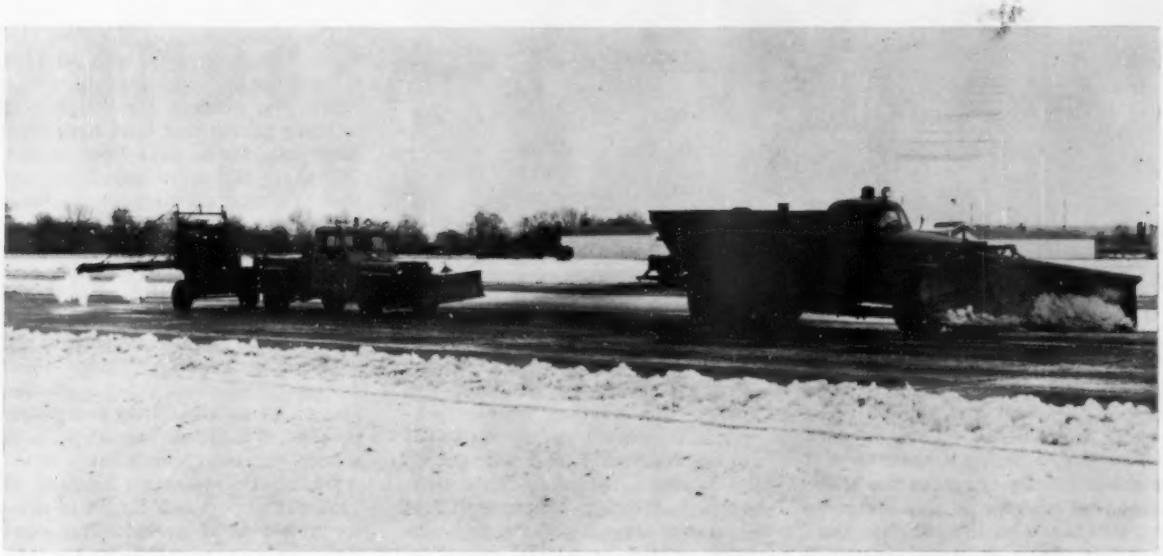
The problems of snow and ice removal have been constantly studied and improved at Port Columbus, the Columbus Municipal Airport, since an 18-inch snowfall in 1950. That, incidentally, was the last time the field had to be closed because of snow and ice.

Port Columbus compares favorably in size with most municipal airports. It has some special problems that many of the others do not have. The airport is in the middle of an expansion program. This means that the main runway is more than half a mile from the present passenger terminal. It is not only necessary to keep the runway open, it is necessary to provide a means of reaching the parking ramps from the runway.

The runways, taxiways, and commercial plane parking areas are equal in area to about 42 miles of two-lane highway. But that is by no means an indication of the complete problem. Snow has to be moved only 12 feet to clear a 24-ft. highway. It must be moved 75 feet to clear a 150-ft. runway.

The work of clearing snow from

● **ECHELON of plows attack snow on wide runway; move at 20-25 miles per hour.**



● **WEED-BURNER at far left of photo is used to embed sand in the ice. Sand spreading equipment precedes the burner.**

runways must follow a pre-arranged plan. In our system of operation, we make the original pass down the center of the main runway. continuing on to the end, making a 'U' turn at the end of the runway, returning back along the original pass. Once this runway has been cleared, snow is piled at the intersections of other runways and taxi strips.

In order to keep the original runway clean, we then do the various intersections in such a manner as to prevent piling of snow on runways already cleared. Effective snow clearing is the result of a good plan and full cooperation of everyone on the airport.

During the fall and winter, I make certain that either my assistant, my general foreman, or myself can be reached at any time by the Weather Bureau. Normally, snowfall or icing conditions occur during hours other than the normal working day, which necessitates our informing the field personnel of their possible recall to the airport for snow or ice control. In trying to establish the amount of snowfall to be expected, we check field conditions at airports up to 300 miles to the West and Northwest of the Columbus area.

The Civil Aeronautics Administration control tower operators keep in close contact with radio equipped trucks on the snow removal jobs. This close coordination is required since aircraft will be landing and taking off while ice and snow control work is in progress. If the control tower holds our equipment away from the runways too long, it could necessitate the closing of the field until such time as we have accomplished our mission. Our past experience has been that the control tower operators do everything possible to coordinate flight activity with snow and ice control, since they are well acquainted with the seriousness of the situation. The airlines cooperate in moving their ground equipment so ramps can be quickly and easily cleared of snow. If boarding ramps, fuel trucks, or other ground equipment becomes bogged down, it can also stop the flying operation.

The first concern at Port Columbus when snow starts falling is keeping the main, 8000-ft., east-west runway clear. If reports from Indianapolis, Dayton, and other points west indicate a fall of two or three inches, plowing starts after an inch of snow has fallen. The important matter is to keep up with the snow. Due to the distance the snow must be moved, any build-up is a danger to equipment. Our trucks, working in teams up to five plows, must keep moving 20 to 25 miles an hour to do the best job of snow removal. If the accumulation of snow on the edges of the runway appear to be deep enough to be hazardous to safe flying conditions, we use a rotary snow plow to remove these banks of snow.

After the main runway is cleared, the plows work from the terminal along the northwest-southeast runway. This intersects the main runway near its center and is the best turning off place for planes landing from east or west. Attention is next given to the passenger ramp. Snow is cleared out away from the terminal building to the land between the runways. Then attention is turned to the other two runways and the taxi strips.

Light snowfalls on the taxi ways are often not plowed. The important thing is keeping a safe landing strip. A taxiing plane gets its power from propellers or jet thrust and does not depend on traction from the wheels to progress. It is important to provide sand in the holding areas adjacent to the runways in order that the aircraft have sufficient braking action to perform their normal run-up procedures.

Our snow removal crews worked overtime no fewer than 22 times during the past winter in clearing the runways of snow and ice.

While the snow problem is usually taken care of soon after the snow-

● **WEED-BURNER in use—see below. It is a help under certain icing conditions.**

fall stops, the ice problem is more serious. Long periods of freezing are not common in Columbus. The usual thing is an afternoon thaw followed by freezing temperatures at night. If a thaw occurs in the afternoon, we attempt to put limestone sand in place on the runways during this thawing period in order that it will freeze in place as the temperature drops in the early evening hours. If this were not done, there would be a layer of glare ice on the runways.

Airports are not permitted to use calcium chloride or other chemicals that have a thawing action because of their possible corrosive effect on relatively thin airplane skins. We must add traction to the ice. This is done by adding blue limestone sand to the runways during periods of thaw. This sand has sharp edges and gives the best results in creating braking surfaces. Added during the thawing period, it freezes into the ice.

Sand placed on top of the ice builds up in front of the braking wheels and has little effect in helping the plane to come to a safe stop. We have found that adequate sanding of all runway and taxi surfaces takes about 180 tons of sand. This complete sanding, however, is hardly ever necessary. During the past winter, we used a total of 1200 tons of sand.

The one unsolved problem was what to do about ice that formed before it could be sanded. The answer was a relatively inexpensive ($1200) weed burner. The sand spreading truck, also equipped with a snow plow, is followed by this burner. The distance of the flame from the runway is determined by the hardness of the ice in most cases. The flame must move at a rapid pace, be hot enough to soften the ice so that it is penetrated by the sand, yet not be so close that it will damage the runway or blow the sand away before it becomes imbedded in the ice.

If there is any doubt in our minds as to whether or not sand should be used, we proceed with the sanding operation. One wet day late this season, the weather bureau predicted temperatures of 33 to 35 during the night. Sand was put on the runways regardless. The temperature dropped to 28 and Port Columbus was one of the few airports in the area not forced to close down because of field conditions.

Keeping the airport open not only means safe operations, it means money for the City. When planes are not operating, the concessions are not making as much money as they should—and this cuts the City's income. The sand used during the past winter, for instance, cost about $2800. The continued operation of the restaurant during these occasions meant more income to the City than the expenditure for the sand.

The snow removal operation takes only seven men. Many of the snow removal trucks are operated completely by one man. The lead truck and last truck have two-way radio contact with the control tower. All of the equipment, except the sand spreader, has year-round use at the airport. Much of the sand is dissipated by jet blast and propeller wash. The rest is recovered at the end of the freezing season, but is not reused because foreign matter is collected which could cause damage to the spreader.

The effectiveness of the Port Columbus snow and ice control plan is seen many times each winter when you observe the number of military planes that land here after their own bases have been closed. Many airports have asked for advice in setting up their own removal programs, and we have been more than happy to give them all of the information we had available.

We believe that it is possible to keep the runways open to traffic. The general public is relying on airport operators to provide them with safe, dependable transportation, and all of us should do everything possible to maintain our airports in a safe operating condition.

During the weekend blizzard of 1950, the airport was forced to close for a few brief periods. But runways were open long before streets and roads were cleared. In fact, the tremendous importance of keeping the airport open was brought home most vividly when we found the entire community completely tied up. Through the use of cargo planes, we were able to fly into Columbus large numbers of chains which were turned over to the Civil Defense agency who, in turn, assigned them to all of the emergency vehicles and personnel who had to continue performing their functions.

Three days of continuous work kept the airport open so that badly needed supplies could be flown into the city. We learned during that blizzard, incidentally, that deep snow would bog down our two-wheel drive equipment unless it had chains. We did not have the chains then, but we have them now and are ready.

While the effects of a good snow removal plan can be seen in fewer cancelled operations, and a more profitable airport, it is the idea of keeping a safe haven for planes and their human cargo that really makes the program worthwhile.

● **SAND only is used on ice because of possible chemical action on airplane skins.**

NOMOGRAPHIC SOLUTIONS FOR THE DESIGN OF TRICKLING FILTERS and SEDIMENTATION TANKS

WALTER R. LYNN,
Director of Research,
Ralph B. Carter Company

IN THE DESIGN of sanitary engineering installations, simplified nomographic solutions for repeated mathematical formulas can and have represented considerable time savings in initial design estimates. The purpose of the nomographs presented here is primarily to reduce the computation time for a preliminary investigation of the size of units for a trickling filter complete treatment sewage plant. It should be borne in mind that nomographic solutions cannot offer the accuracy that could be offered by mathematical computation. However, it is common knowledge that the designing engineer is ofttimes called upon to give quickly an estimate of general unit sizes for a particular proposed treatment plant. During the planning stages of such a treatment plant, the use of the nomograph will allow a comparatively accurate rapid computation of clarifier sizes, final and primary, and of the trickling filter, whether it be high or standard rate—with a small expenditure of time.

Although the nomograph for the design of trickling filters is essentially correct in terms of its representation of the NRC formula:

$$P = \frac{100}{1 + .0085\sqrt{\frac{W}{ADF}}}$$

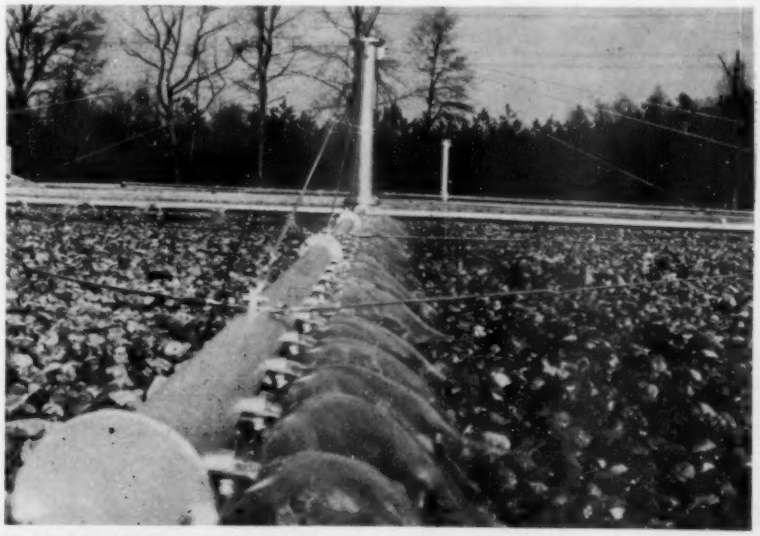
great precision is lost, however, in scale distributions. Consequently, it is suggested that this nomograph be used primarily for initial estimates or gross estimates of trickling filter sizes.

This nomograph may also be used for the computation of the theoretical percentage of BOD removal in any filter given the filter diameter, the depth, recirculation factor, and the pounds of BOD applied per day. Computation of filter dimensions can be made by selecting the desired percent of BOD removal and the pounds of BOD to be applied to the filter per day. The filter bed diameter, the depth, and the recirculation ratio can then be determined. The second nomograph relates to the design of sedimentation tanks, primary and final. Essentially, the removal percentages of BOD is based on the Standards for Sewage Works published by the Mississippi River Board of Public Health Engineers and the Great Lakes Board of Public Health Engineers. Through this nomograph we can select a settling tank diameter and side water depth, dependent upon the surface settling rates and the detention period as selected by the designer. Again, this nomograph is subject to scale errors and consequently cannot be used as a final designing device; however, its function can be utilized for obtaining rather accurate estimates of clarifier diameters and depths for specific removals as relates to the UMRB design criteria.

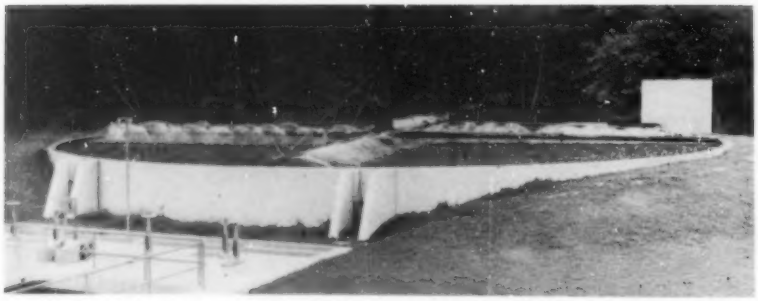
Trickling Filter Design

The nomographs presented here have been designed in keeping with the Upper Mississippi River Board (UMRB) of Public Health Engineers Manual, "Standards for Sewage Works" (May 1952). It was decided to utilize these Standards inasmuch as they have been used and/or adapted for use by most states. The design limits *are not indicated* on the nomographs. It is suggested that those utilizing this graph familiarize themselves with appropriate state limitations in terms of application of the graphs.

The Trickling Filter Nomograph at first inspection appears too complicated and time consuming to be of much value, however, if a few



● **TRICKLING filter in Henrico County, Va., Sanitary District No. 5 Nomographs shown in this article permit rapid calculations for determining proper filter size.**



● 80 FT. Filter serves the Pearl River-Orangeburg, New York, Sanitary District.

sample computations are made, it can be shown that the graph is truly a time saver.

Design of a Filter

In order to use the nomograph only three values must be known: (1) the percent BOD removal desired through the filter; (2) the pounds of BOD which will be applied to the filter per day; and, (3) the total gallons of waste (in mgd) applied to the filter. (A valid assumption is that 65 percent of the daily *raw* sewage BOD will be applied to the filter.) Knowing these values, it is then possible to examine and select comparative sizes, depths, rates of application and recirculation, if required.

Step 1. Through the scale "% BOD Removal" locate the % of BOD to be removed from the filter (within the latitude ranges as indicated on these scales).

Step 2. Extend a line through value on "% BOD Removal" scale through intersection of R-R and T-T until it strikes a point on "Pounds of B. O. D. Applied per Acre-Foot" scale. (This will yield a value for BOD loading rates in terms of Pounds per Acre-Foot or Pounds per 1000 cubic feet.)

Step 3. Join known value of "Pounds of B. O. D. Applied to filter per day" with the point located in Step 2 and note intersection of Scale R-R.

Step 4. Project this point on Scale R-R along the parallel guide lines to a point of intersection on scale T-T.

Step 5. The point located in Step 4 (above) becomes the pivot point for relating depth and area figures to meet design requirements as found in *Step 2.* With a straight edge pass a line through pivot point on scale T-T and read values from scales—"Effective Depth (Ft)" and "Filter Bed Diameter (Ft)". Any combination of Effective Depth and Bed Diameter will meet design criteria in terms of organic loading. NOTE: The concept of effective depth is related to recirculation in Hi-Rate Filtration. In a Standard Rate Filter, the effective depth is equal to the actual depth and recirculation is zero. The effect of recirculation, or the recirculation factor *F* where:

$$F = \frac{1 + R/I}{(1 + 0.1\ R/I^2}$$

allows, in the NRC formula for trickling filters, for a mathematical combination of Depth & F, which is labeled effective depth. Consequently the recirculation factor (F) has the effect of increasing the depth. The actual depth can then be found through a nomographic solution shown on the chart which relates the effective depth through a recirculation ratio R/I.

Step 6. Practical Selection of Depth & Area—Diameter values will be dependent upon design criteria and economic considerations to be evaluated by the designer.

Step 7. The "Hydraulic Loading Rate" may be checked by passing a line through Filter Bed Diameter as selected in *Step 6* and the "Daily Flow to the Plant (MGD)" to the "Hydraulic Loading Rate (MGAD)" scale. Area and flow combinations should fall into category of high or standard rate depending upon criteria chosen. If this does not occur adjustment of filter diameter and depth should be made to accommodate the hydraulic loading rate.

Computation of Theoretical Efficiency

When an existing filter is in operation the theoretical efficiency can be easily computed with this nomograph. All the following factors should be known from the installation: (1) Filter diameter; (2) actual depth; (3) recirculation ratio; and, (4) pounds of BOD applied to the filter.

Step 1. If recirculation is used, join values of "Actual Depth" and "Recirculation Ratio" to determine the "Effective Depth".

Step 2. Join value of "Effective Depth", as found in *Step 1,* with values of "Filter Bed Diameter" and note point of intersection with scale T-T.

Step 3. Project point at T-T along parallel lines to intersection with scale R-R.

Step 4. Through R-R and value of "Pounds of BOD Applied to Filter" locate value of "Pounds of BOD applied per Acre-Foot".

Step 5. Through value found in Step 4 and point of intersection of scales R-R and T-T join a line to intersection with "% BOD Removal" scales. This value yields the theoretical "% BOD Removal" for the filter of given size.

EXAMPLE 1—High Rate Filter (Follow Red Lines)

Assume—1) BOD Applied to Filter = 1668 lbs/day; 2) Desired BOD Removal = 55% at Chicago, Ill. (between Lats. 40 & 45°); 3) Flow = 1 m. g. d.

Step 1. Draw line (A)-(B)

Step 2. Connect (B) with point (C) (1668 lbs. from assumption above) and note point (D)

Step 3. Transfer (D) to point (E).

Step 4. Join Bed Diameter with Effective Depth Scale—Selection made at points (F) & (G)
Bed Dia. = 50 Ft., Effective Depth = 7.7 Ft.

Step 5. Using a R/I ratio of 0.5:1 actual depth is found at (H)—Actual Depth = 5.8 Ft.

Step 6. Join Bed Dia. and flow (F) to (J)—indicates hydraulic loading with allowing criteria of 10 to 30 MGAD.

Results: Hi-Rate Filter, Bed Dia. = 50 Ft., Bed Area = 0.045 Acre. Depth = 6.1 Ft. Recirculation Rate = 0.5:1, BOD Removal 55%.

EXAMPLE 2—Standard Rate Filter (Follow Green Lines)

Assumptions—1) BOD applied = 1668#/Day; 2) Flow to plant = 1.0 mgd; 3) Desired BOD Removal = 85% at Chicago, Ill. (between Lat. 40 & 45°)

Step 1. Draw (A)-(B) through intersection of R-R & T-T.

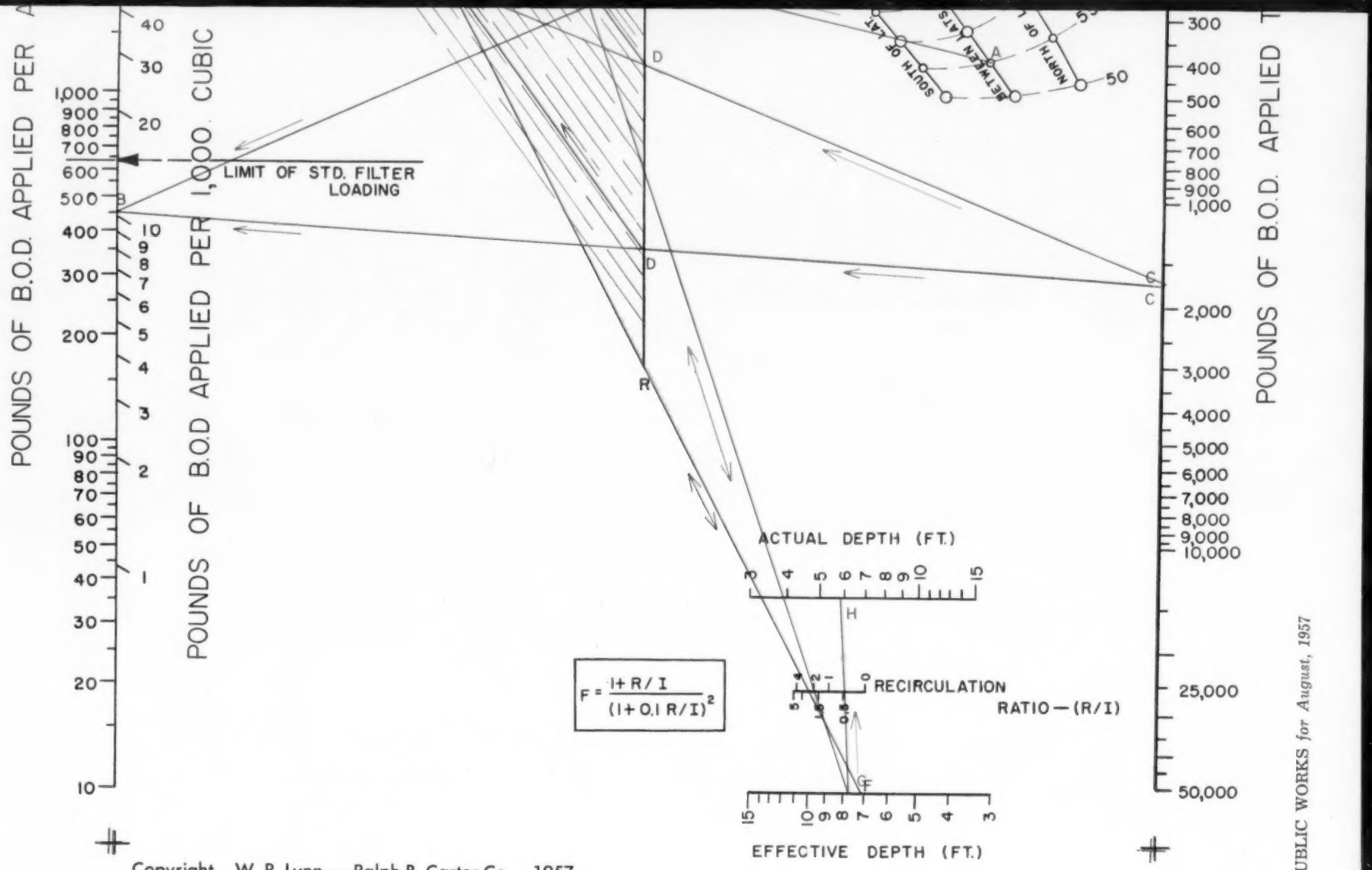
Step 2. Connect point (C) (from above assumption 1) to point (B) and note point (D).

Step 3. Project (D) to point (E).

Step 4. Select Diameter and Depths (G) and (F).

Step 5. Check hydraulic loading rate by passing line from point (G) and flow to filter (Assumption 2).

Results: Standard-rate Filter, Bed Dia = 170 Ft., Bed Area = 0.52 Acre = Bed Depth = 7.0 Ft. % BOD Removal = 85%. Recirculation Ratio = 0.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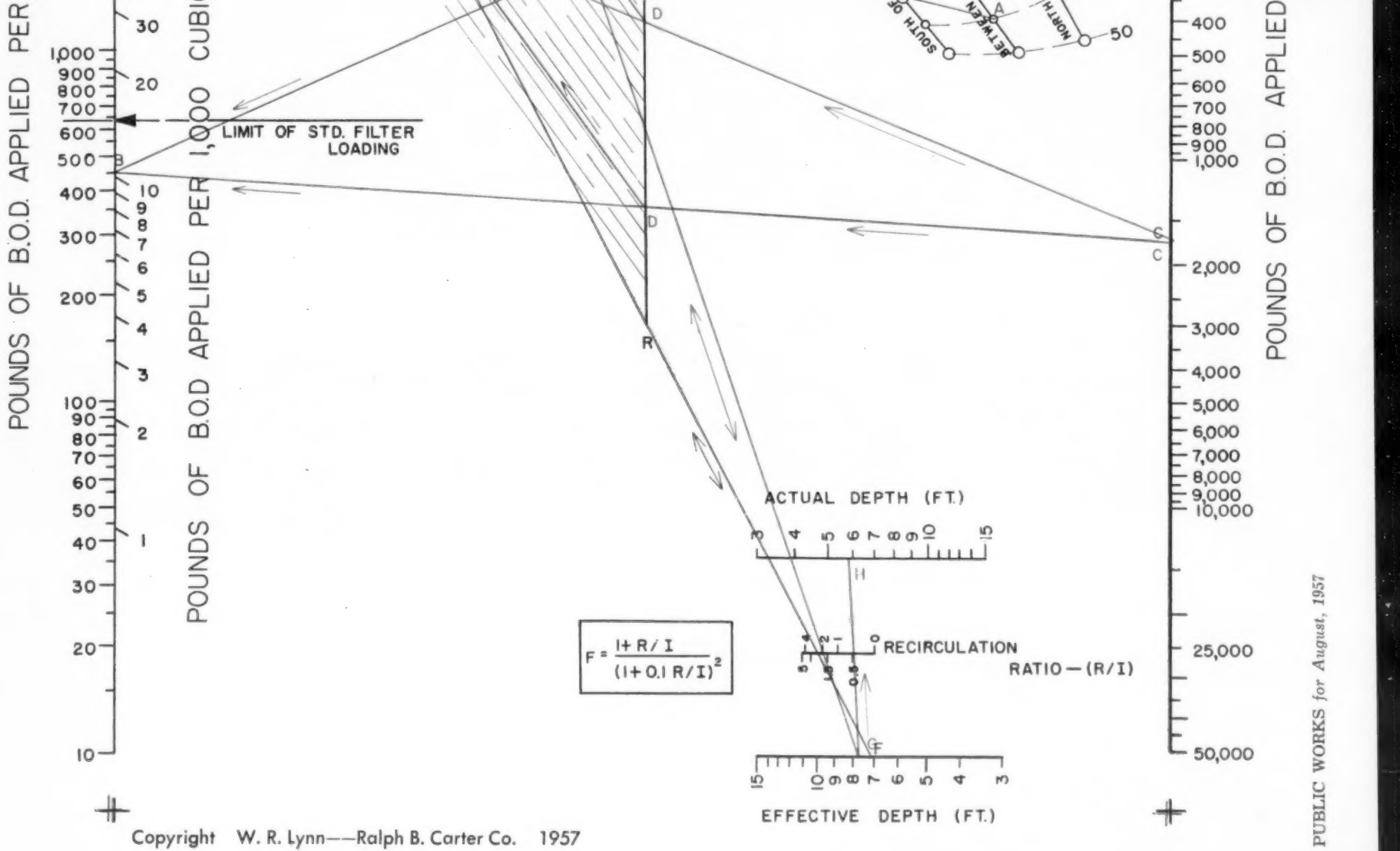
EFFECTIVE DEPTH (FT.)
$F = \frac{1+R/I}{(1+0.1\,R/I)^2}$
Copyright W. R. Lynn——Ralph B. Carter Co. 1957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LIMIT OF STD. FILTER LOADING
ACTUAL DEPTH (FT.)
RECIRCULATION RATIO — (R/I)
EFFECTIVE DEPTH (FT.)
$F = \frac{1+R/I}{(1+0.1\,R/I)^2}$
SOUTH OF
BETWEEN
NORTH
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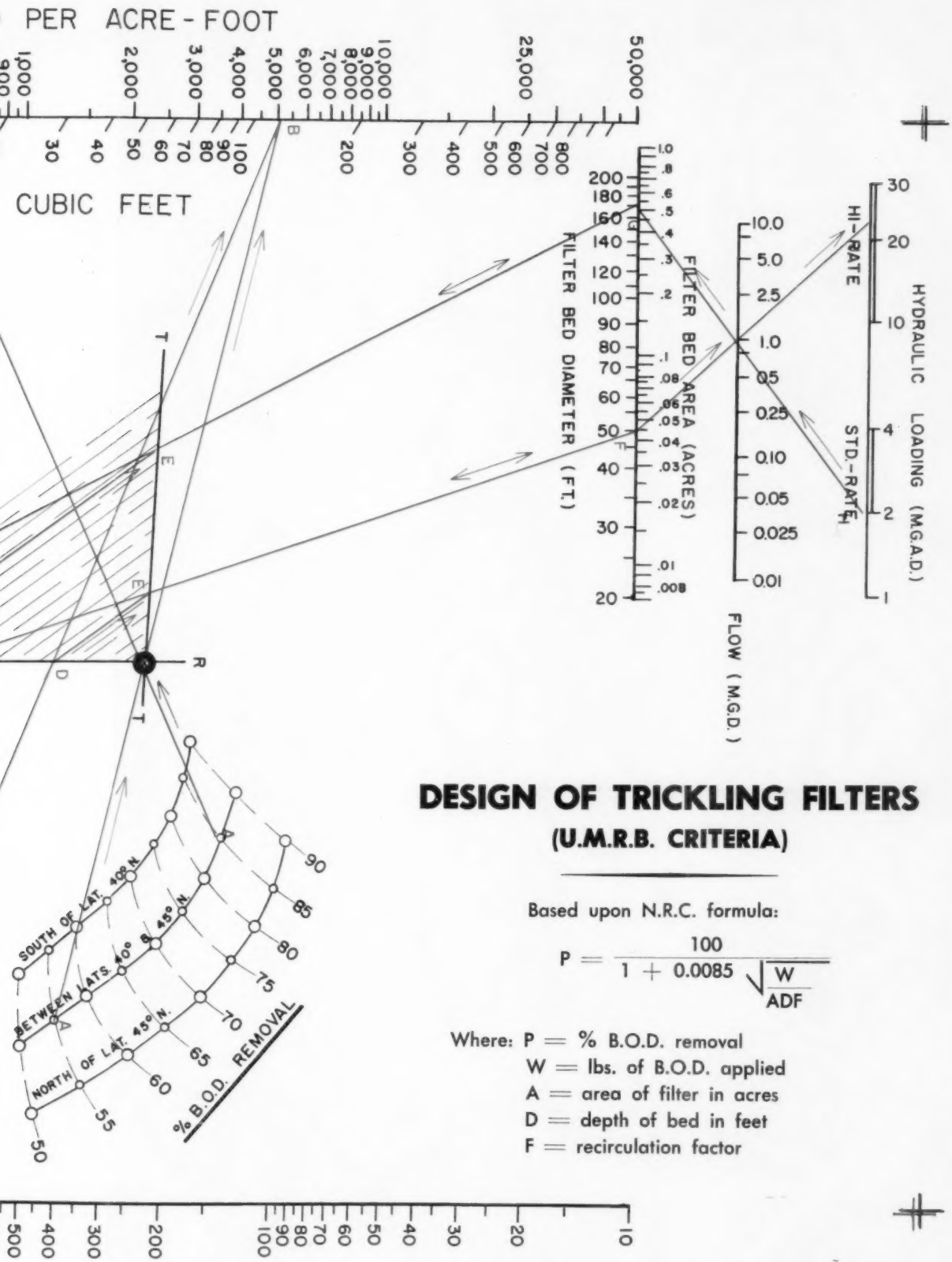
Copyright W. R. Lynn——Ralph B. Carter Co. 1957



DESIGN OF TRICKLING FILTERS

(U.M.R.B. CRITERIA)

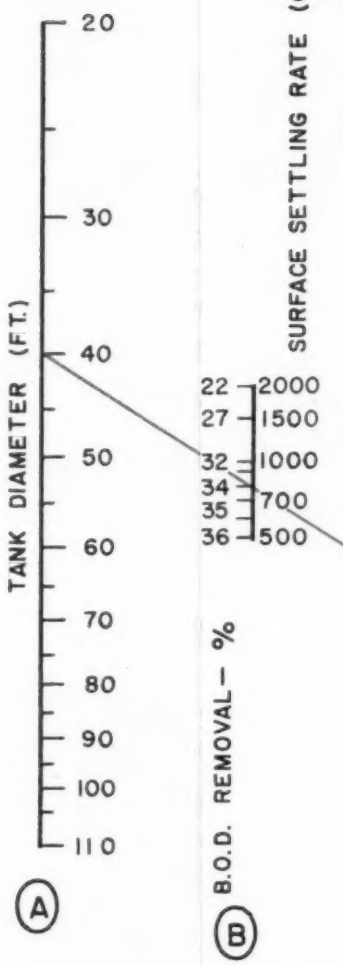
Based upon N.R.C. formula:

$$P = \frac{100}{1 + 0.0085\sqrt{\frac{W}{ADF}}}$$

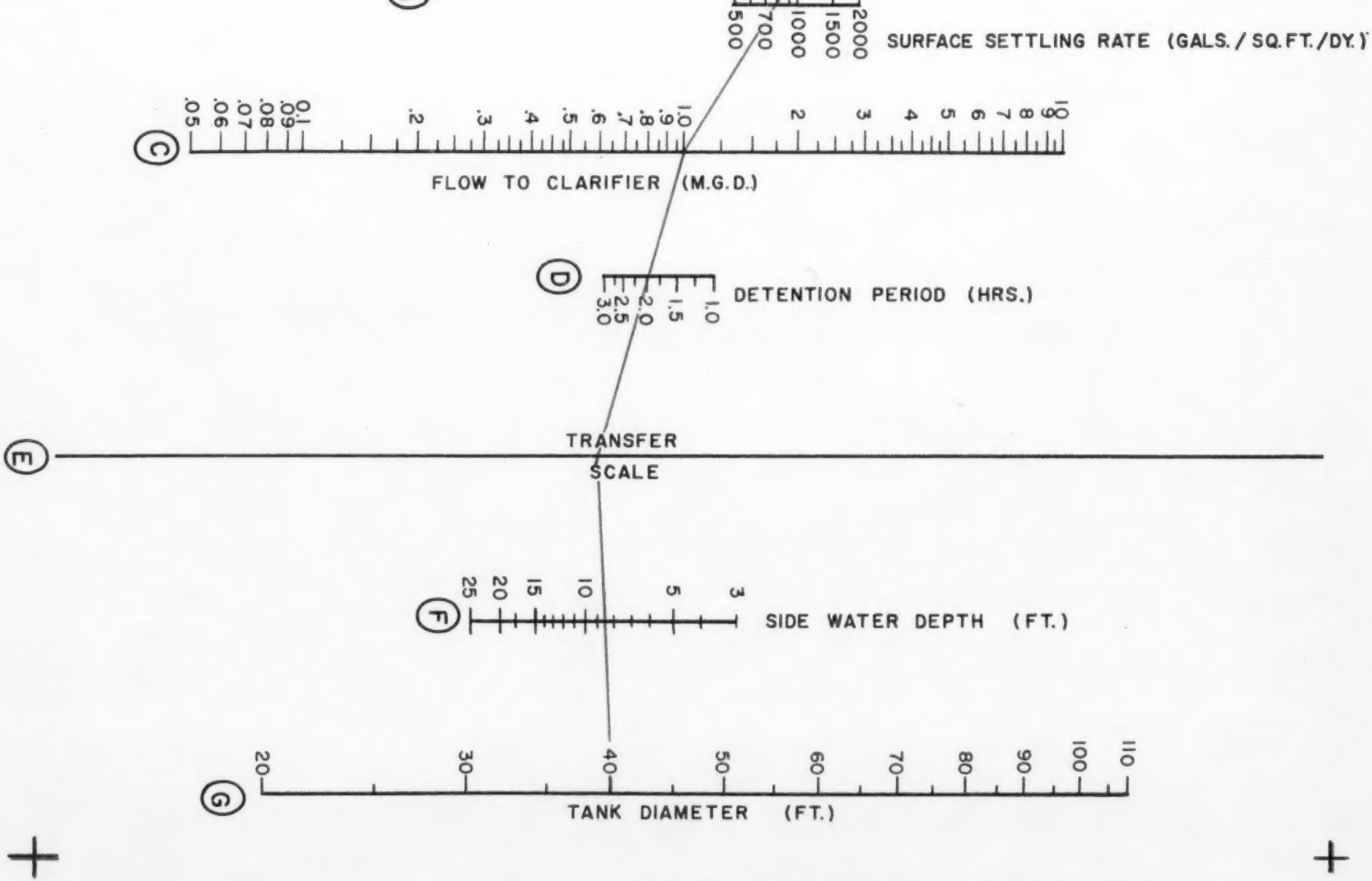
Where: P = % B.O.D. removal
W = lbs. of B.O.D. applied
A = area of filter in acres
D = depth of bed in feet
F = recirculation factor

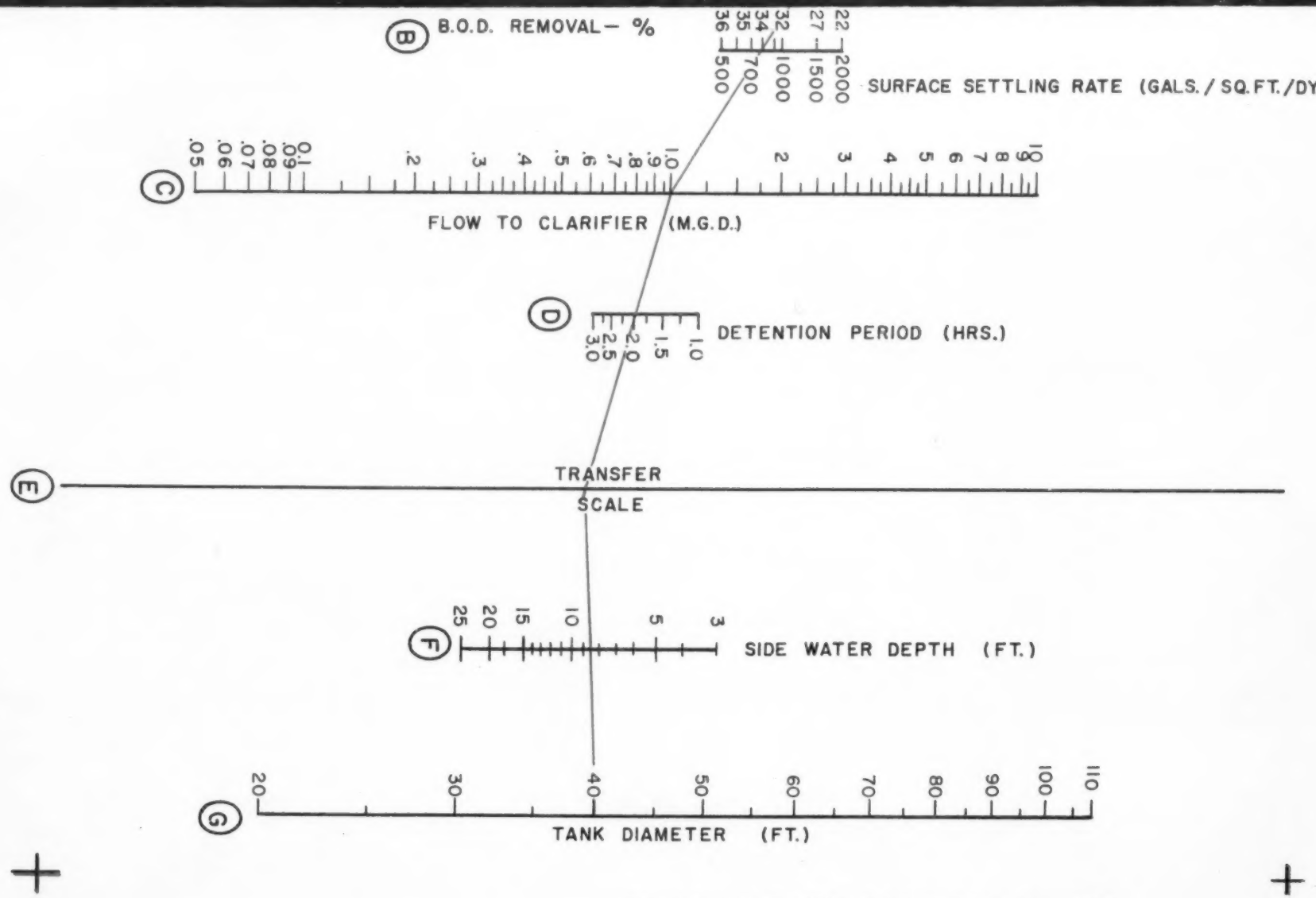
DESIGN OF CLARIFIERS

1. Select flow (C) and desired removal (B). Connect scales (B) and (C). Read diameter on scale (A).
2. Connect value at (C) with detention period (D) to intersection at transfer scale (E).
3. Connect (E) with diameter (G). Find same value as previously found on (A). Read depth on scale (F).



FOLD OUT—DO NOT TEAR





Clarifier Design

The U. M. R. B. Standards for the design of sedimentation tanks are based on the fact that sedimentation is dependent upon surface loading rates and independent of the depth.

Selection of Clarifier Size

Assumptions—Only three assumptions must be made to utilize this graph: 1) the flow of sewage which will enter the clarifier; 2) the desired % BOD Removal in the clarifier; and 3) Detention Time (hrs).

Step 1. Connect a line between the "Flow to the Clarifier (mgd)" and the desired "% BOD Removal" and extend to "Tank Diameter" Scale.

Step 2. Extend line through "Flow (mgd)" and the desired Detention Time to Transfer Scale.

Step 3. Through value found on "Transfer Scale" in *Step 2*, and "Tank Diameter" as found in *Step 1*, join a line and read "Tank Depth".

EXAMPLE 3—Clarifier Design

Assumptions—1) Flow = 1. mgd; 2) Desired BOD Removal = 34%; 3) Detention Time = 2 hrs.

Step 1. Connect flow of 1.0 mgd (Scale C) to Desired % BOD Removal (Scale B) and Read Tank Dia. = 40 Ft.

Step 2. Connect flow (Scale C) to Detention Period of 2 hrs. (Scale D) to transfer scale E.

Step 3. Connect value on Transfer Scale E to value of Tank Diameter as found in Step 1 on Scale G and real value of depth on Scale F = 8.6 Ft.

Results: BOD Removal = 34%, Tank Diameter = 40 Ft. Tank Side Water Depth = 8.6 Ft.

● **SEWAGE treatment plant at Shippensburg, Pa., has 90-ft. diameter filter and 55-ft. primary and secondary clarifiers. Nomograph opposite speeds clarifier design.**

CITY AND STATE JOIN TO BUILD SEWAGE TREATMENT PLANT

R. H. VAN DEUSEN
City Manager,
Clarinda, Iowa

ONE WAY to reduce the cost of sewage treatment plant construction and also reduce the cost of operation, is to combine two or more governmental jurisdictions to be served by the same plant. For instance, both a city and a county can contribute toward the construction and operation of a sewage treatment plant when both are providing sanitary sewer service in the same geographical area. Similarly, a city and a suburban town or township can join forces toward the same end.

In Clarinda, Iowa, a new sewage treatment plant was recently constructed to serve the City and the Clarinda Mental Health Institute, a State institution located a half mile north of the city limit.

In 1949 the City acquired a small sewage treatment plant a mile southeast of the City which had served a prisoner-of-war camp during World War II. This plant included an Imhoff tank and trickling filter worth approximately $100,000; but the plant was considered adequate to serve only 2,400 people, whereas the City had 4,600 people connected to its sewer system. Also in 1949, the Board of Control of State Institutions acquired an option on a site for their own sewage treatment plant north of the City and east of the Institute.

The idea occurred to the city council that if the sewage from the Institution could be brought to the site of the City sewage treatment plant, and if the plant could be enlarged sufficiently to handle the combined flow, it might save money for both the State and the City.

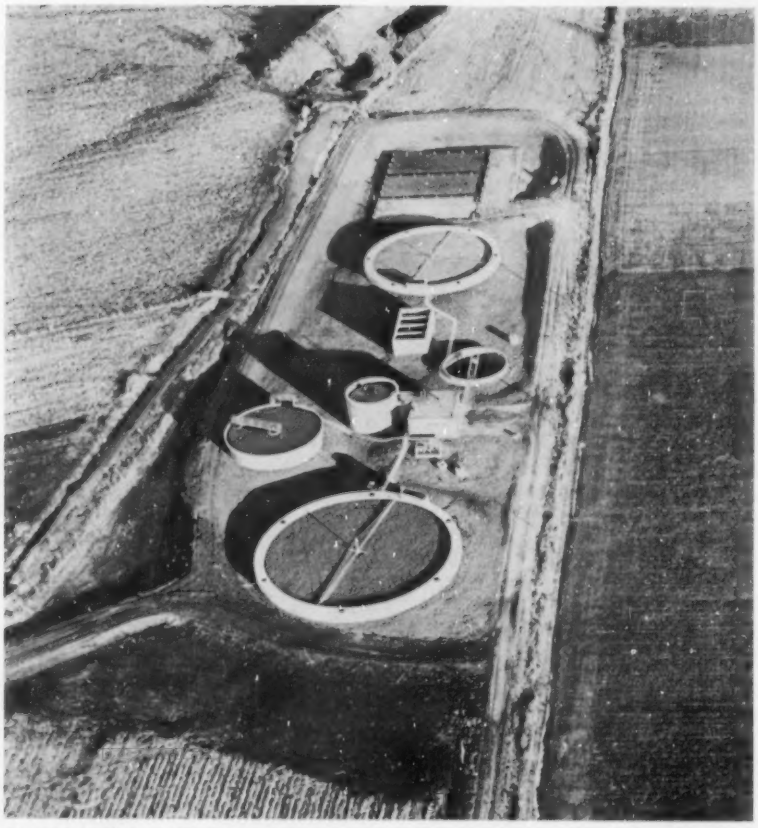
With this in mind, the city officials met with the Board of Control and proposed that they delay construction of their proposed plant long enough for the City to have an engineering survey made. The Board agreed to do this and the City employed Stanley Engineering Company of Muscatine, Iowa, to make the survey.

The engineers found that it was feasible to provide gravity flow for the Institute sewage to the site of the City's sewage treatment plant by laying two miles of vitrified clay sewer pipe. Further, they determined that there were very substantial economies to be obtained by combining the flows from the two sewer systems and constructing one plant instead of two. They proposed to use the Imhoff tank from the original sewage treatment plant, stripped of its interior partitions, as a cold storage sludge tank, reducing the size of the heated digester. They further proposed to use the existing filter to reduce the amount of new filter capacity that would be needed.

Agreement Bases

Using the engineer's report as a basis for further negotiation, the City obtained agreement with the State Board along the following lines:

1. The City agreed to take and treat all Institution sewage for a flat rate of $1 per capita per year,



● AIR VIEW of Clarinda treatment plant shows arrangement of principal units.

payable annually, based on the Institute patient and resident operating personnel population on January first of each year.

2. The State agreed to contribute $132,000 toward the cost of the addition to the City's sewage treatment plant, plus $25,000. The first figure was the original estimate of what it would cost the State to build its own plant. The second figure was half the estimated cost of the two miles of outfall sewer line to bring the Institute sewage to the plant. This amount was approximately what the State would have had to spend to build a needed new outfall sewer from its own proposed sewage treatment plant to the river.

3. The City guaranteed that the State investment and operating cost would not exceed the figures stated above, regardless of circumstances, as long as the Institute population did not exceed 2,200. The Institute population was about 1,600 at the time of contract negotiation.

This agreement was unique in several respects. First, it was a perpetual contract with no termination date, so that the State was assured of perpetual service. Second, it fixed the State's investment at $157,000 regardless of construction costs at the time of contract letting, the City agreeing to absorb any excess project costs over the estimated total cost of $283,000. Third, it fixed the State's annual share of operating cost so that there could be no dispute about metered flows, actual cost of operation, etc. And last, the City was to be the sole owner and operator of the combined plant, the State being a customer rather than a part owner.

These features of the contract appealed to the Board of Control because of previous experience with combined ownership, percentage of cost and metered flow agreements, all of which are subject to question and dispute when determining the amount due for services.

After satisfactory agreement had been obtained between the City and the Board of Control, the contract had to be approved by the Attorney General's office. This approval was not easy to obtain. There was no provision in the statutes for the payment of State funds to the City for such a purpose. Furthermore, it was not legal for the City to render sewerage service to a customer outside the city limits.

The city council decided that they would seek special legislation to legalize both the State expenditure and the sewerage service outside the City. Accordingly, the City attorney drafted the necessary legislation, and after getting the proposed bills approved by the Attorney General's office, they were introduced by the local Senator and Representative in the 1953 session of the Iowa legislature. After the necessary committee hearings, the bills were passed by both houses and signed by the Governor.

The engineers were authorized to proceed with preparation of plans and specifications, while the City proceeded to obtain easements for the two miles of outfall sewer. In February 1954, the needed easements were obtained, and the construction contracts were let.

In the intervening years between the original survey and the letting of the contracts, construction cost had risen so that the final total project cost was $333,000 instead of $283,000, an increase of $50,000. This meant that the City's share of the project was $176,000 instead of $126,000. The original estimate for a separate City plant had been $201,000, so the City saved $25,000 in construction costs. It seems quite likely that, by the time the contract for a separate city plant could have been let, the cost would have been $225,000. If this assumption is correct, then the City saved nearly $50,000 by virtue of the agreement with the State.

The plant was completed and placed in operation in January 1955. Throughout construction, and during the period of operation to date, there has been no difficulty in dealing with the Board, indicating that the contract agreement was carefully drawn and avoided the pitfalls common to other joint agreements. The plant is in its third year of operation. The essential difference between a separate city plant and a combined plant is the increased flow in the combined plant. The direct costs resulting from the increased flow are primarily pumping costs, together with such intangibles as the maintenance of somewhat larger plant components than would otherwise have been necessary. The $1 per capita per year agreement covers these costs, yet is far below what it would have cost the State to operate a separate plant.

Our satisfactory experience convinces us that separate governmental jurisdictions should make every effort to effect the economies inherent in combined public facilities.

Better Refuse Collection *with* PACKER-TYPE TRUCKS

J. L. MORRISON

FROM INCINERATION to landfill is one step. From landfill with open-body trucks to landfill with packer-type trucks is another step. This evolving pattern sums up the refuse collection story of Burlington, N. C., an industrialized and fast-growing city of 30,000. Says City Manager J. D. Mackintosh Jr.: "The incinerator the city built in 1938 could not handle the refuse delivered to it 10 years later." Landfill with open-body "scows" was not the answer either, because new and progressive business elements in the city began to object not only to the expense but to the flies, odor and spillage that occurred in using "scows."

In 1952 Burlington acquired its first packer-type trucks, two more in 1954 and one each in 1956 and 1957. Today it has six packer-type trucks in operation supplemented by five remaining open-body jobs, the latter relegated to collecting tree limbs and other bulky matter that would slow up packer-type collecting schedules.

"A city with our rate of growth," Mr. Mackintosh estimates, "will need an additional packer-type truck every three years plus the normal replacement on worn-out equipment. What with two suburban annexations in 1956 and an earlier one in 1955, we've got to plan ahead for an adequate refuse collection system. I'd say the only chance we've got to keep up is with the economy and efficiency of packer-type collection."

Another way of gauging small-city growth is to compare Burlington's Sanitation Dept. budget for 1950 ($65,000) with that for 1957 ($102,000). This spectacular increase reflects the city's healthy residential and business growth. But it would be impossible to keep up with this kind of growth using the antiquated open body trucks.

Collection Equipment

Burlington's packer-type trucks include the following: 2 Gar Wood packers, 13-yard capacity, hydraulically operated and mounted on F700 Ford bodies of 18,000 GVW; 2 M-B Packers (Markham Municipal Equipment Co.), 16-yard capacity, mechanically operated and mounted on International bodies of 21,000 GVW; and 2 more M-B Packers, 14-yard capacity, mechanically operated and mounted on Chevrolet trucks of 16,000 GVW.

Richard P. Moore, Burlington's Sanitation Superintendent, dispatches 21 men—7 drivers and 14 helpers—on a six-day-week collection schedule. Curb pick-ups in residential areas take place three days a week; pick-ups in the business section occur every day. Mr. Moore also dispatches a couple of "white wings" and a street flushing and sweeping crew.

Packer-type trucks in Burlington operate with a three-man crew, driver included. This is the same size crew needed for the old scows, the difference being that in the latter, one man had to be up in the truck, and in the packers two men are on the ground.

A normal day's work for one pick-up crew averages 750 homes in a residential area. This depends, of course, on the distance to the landfill and whether the truck can pull up to a curb or must be loaded across the ditch of an unpaved road.

That a public service device can sometimes backfire is evidenced by Burlington's three-month experiment in 1955 with back-door pick-

● **ONE of the four M-B packer-type refuse collection units operated by the City of Burlington. With 3-man crew, each unit averages service to 750 homes per day.**

up of refuse and garbage. It ran up the collection budget to an extent that alarmed the City Council, Mr. Mackintosh reports, and did not even find favor with the householders.

"Newcomers to Burlington," he explains, "would like a system of back-door pick-ups. But long-time residents had gotten used to curb pick-ups and didn't want strange men coming to their back yards. That was one strategic retreat we had to make."

Continues Superintendent Moore: "We used to average six or seven trips a day to the landfill with open-body trucks and our average for packers is down to around four a day.

"While it's true that a 'scow' with a good man on the ground—something of a Tarzan—could handle 60 percent of the load that can be handled by a packer truck, you had a big personnel problem. Ordinarily our experience is that we gain two or three times in space and weight with a packer as opposed to an open-body truck. Scows presented their safety problem too, and Burlington officials speak of this problem out of hard experience. One garbage collector had to spend 10 months in the hospital with a back injury suffered through a fall from the top of an open-body garbage truck.

Litter Reduction

"While it's hard to estimate in dollars and cents the actual savings of converting from scows to packer-type trucks," City Manager Mackintosh says, "It's safe to say that no normally growing city can afford not to convert. You can tell refuse collectors to affix a tarpaulin to the top of open garbage trucks, but they won't always do it and you can count on some windy days too. The result is litter in the streets and this develops into a chain reaction every time. When people see littered streets they go along with 'established custom' and use the streets as garbage receptacles.

"In an industrialized city like ours, it's especially needful to set factory workers a good example. Somehow they're especially prone to fill their cars with on-the-job refuse and dump it in the streets. That was the most shocking thing that met me when I first arrived in Burlington."

This absence of litter, made possible by packer-type trucks, was seized upon by Mr. Mackintosh as the opening wedge for a clean-up campaign. The first step was to add "white wings" to the collection crew, an experiment that he terms highly successful. "When people know that somebody else has to pick up the litter they are scattering in the streets, they become a little more considerate. That's our experience."

The next offshoot of packer-induced cleanliness was the installing of pole-mounted sidewalk receptacles (Sydell). And this helped materially in reducing the amount of candy wrappers and paper cups. Burlington is still an industrial city with the normal accompaniment of litter, but now people know it doesn't wallow in it—and this brings up public relations.

Mr. Mackintosh, a firm believer in an Annual Report published by city government, has already issued one such report and is planning to make it a permanent matter. The work of the Sanitation Dept. is a regular ingredient of such a report, and a photo of one of the city's packer-type trucks decorates the page. After a written description of the department's work and its equipment, the report (for an earlier year) notes total miles driven by city vehicles in hauling refuse as 83,489 miles.

The present landfill is at the site of an antiquated cesspool, and the city's public health will be much improved by putting an end to this stagnant water standing in concrete basins.

The upcoming landfill, according to Mr. Mackintosh, will be on part of a tract of 70 acres the city is acquiring for an additional $2 million sewage treatment plant to supplement its present almost-new plant. The new tract includes an abandoned rock quarry that will be utilized for landfill.

● **THESE two refuse collection units are Gar Wood, 13-yard capacity. Modern collection equipment has greatly reduced street litter and resulted in a cleaner city.**

A PARKING LOT TO AID DOWNTOWN BUSINESS

EDWARD J. CONNELL,

Administrative Assistant,

Cleveland Heights, Ohio

● **PORTION of parking lot fronting on Silsby Road. Another view of the lot is shown in the picture below. Spaces were provided for 183 cars at 128 sq. ft. each.**

BECAUSE a nearby shopping center will generate a considerable pull from local business areas, local parking facilities must be provided if downtown business is to survive. The City of Cleveland Heights, adjacent to Cleveland, therefore made an agreement with local benefited property owners to provide local parking relief. Under this agreement, the city became the instrument through which the project was to be carried out. The property owners in the area benefited were to pay two-thirds of the cost and the city the remaining one-third. This type of agreement was necessary because of Ohio Laws regarding off-street facilities.

The City Manager, Ray Martin, was authorized by the Council to take the steps necessary to acquire the land, develop plans and undertake construction of this, the first commercial parking lot. Actually there are two lots, one large and one small; but because of the nature of the development, they were treated as one. Plans and specifications were prepared by Richard Hawley Cutting & Associates and the construction contract was awarded to the R. J. Platten Construction Co. The project is known as the Silsby-Meadowbrook Parking lot. The following items, among others were covered in the specifications, which generally followed those of the State of Ohio.

The driveway apron, a short section of pavement near the entrance and the pedestrian walks for access to the cars were of reinforced concrete. The concrete curbing was colored to match the abutting sandstone curb by adding about four pounds of black magnetic oxide of iron with each bag of cement. Reinforcement was No. 4 gauge mesh, 6 ins. on centers both ways, and welded at points of intersection. The lots were paved with bituminous concrete. The base course was of waterbound macadam, using slag. The coarse aggregate base was 6 in. compacted depth for part of the area and 8 ins. compacted depth for heavy-pavement areas. The leveling course had a compacted depth of 1½ ins. The surface course was Type C bituminous concrete, compacted to a one-inch thickness, giving a completed thickness of blacktop of 2½ ins. A mechanical spreader was used to insure accurate surface grades.

Parking lanes were painted in solid white 4 ins. wide. "No Parking" areas were done in yellow. The paint was applied after the asphalt surface was cured sufficiently so that free bitumen did not penetrate and discolor the paint. Spaces are provided for 183 cars, each space measuring 8 ft. x 16 ft., or 128 square feet per space. The parking lots will be landscaped with shrubbery and lawn, using suitable topsoil and subsoil, with commercial fertilizer. Plantings will include: Ligustrum in staggered rows, 16 inches between rows, at a distance of 24 inches on centers and maintained at a 30-in. height. Taxus Cuspidata also to be maintained at a 30-in. height; Taxus Cuspidata Nana at a 22-in. height; Berberis at an 18-in. height; and widely spaced Malus Spectabilis Albiplena which will probably be maintained at a height of 8 to 10 feet.

The cost of the land was $41,090.40. The engineering costs were $3,252.51 and the appraisal costs were $375.00. A 2-in. water meter was installed at a cost of $241 and a sprinkling system cost $1,384. A cyclone fence costing $191 was placed around part of the lots. The recording and escrow fees amounted to $189.80. The original construction contract was $72,907 and the supplemental contract was $4,828.66. The total cost of both parking lots was $124,459.37. This was broken down to $680.10 per car space.

Parking meters are not included as a parking lot cost and, therefore, not included in the per-car cost space. Meters for the lots are of the dual type.

● **TOTAL COST was $680.10 per car, exclusive of parking meters, but including land, engineering, appraisal, construction, water, fencing and attractive landscaping.**

COUNTY WIDE
Water Study and Inventory

IN LINE with the nation wide concern over the adequacy of water supplies, Bergen County, N. J., recently undertook an inventory of its potential water resources. The work was done by a committee organized by the Board of Chosen Freeholders, the governing body of the County. The report is completed and has been issued by the Bergen County Water Study Committee. Five men comprised the Committee: Chester H. Smelzer, George H. Buck, Roscoe P. McClave, Alfred Crew and Anthony M. Lunetta, the last four of whom are engineers. Included in the report, in addition to the inventory of potential water resources of the County, are an analysis of present water developments, estimates of probable future population and water requirements and a forecast of the additional supplies that will be needed to keep pace with the growth of the County.

Bergen County is in the extreme northeast corner of New Jersey. Situated within easy commuting distance of New York City and the adjacent metropolitan areas, its past population growth has been phenomenal; and this growth is expected to continue. The present population is nearly 700,000 and it is expected to pass the million mark by or before 1990. Based on available suitable land areas, the saturation population is expected to be slightly in excess of a million.

Within the County, which has an area of 233 square miles, there are some 70 municipalities which are served by 16 water systems. A large, but unspecified, proportion of the population is served by these systems.

The 1955 municipal water requirements amounted to 66.4 mgd, and these are expected to increase to 79 mgd in 1960, 96 mgd in 1970 and 109 mgd in 1980, with an ultimate maximum of 124 mgd. As in every other community with generally similar characteristics, peak use of water is high. Maximum daily usage is about 150 percent of the average but some hourly peaks have been very high.

The study concludes that local resources, if properly developed, are more than ample to supply all foreseeable future water needs. Streams with an average daily flow of 350 mgd traverse the county and these can be economically developed to yield up to 130 mgd. Wells tapping underground sources have a potential capacity of 100 mgd.

Present surface water developments on the Hackensack River impound 9,600 mg. which will soon be increased to 13,100 mg. The present regulated flow is 65 mgd; some of this is required for use in lower New York State and Hudson County, N. J., so that 47.5 mgd are available for Bergen County needs. This will increase to 61 mgd in the near future. Tapping underground waters are 133 wells now in service with 10 others being constructed. These are capable of delivering up to 44 mgd, but the installed pump capacity exceeds 50 mgd. In addition, 16.3 mgd are supplied from the Passaic River Valley.

Interconnections between systems can be of great value in meeting future needs. Except for the seven municipal installations in the northwestern part of the County, the various systems are quite well connected. If the northwestern systems should coordinate use of their well supplies with other water systems, existing and authorized wells would be adequate for ultimate needs in this area. With only a limited degree of county-wide coordination it will be necessary after 1970 to develop 24 mgd; without coordination the need may reach 45 mgd.

Total water supply capacities, including wells and other developments definitely planned, aggregate 104.0 mgd on the basis of 1970 estimates; and 101.5 mgd in 1980. The reduction is due to increased usage in adjacent counties (as in Rockland County, N. Y. and Hudson County, N. J.) In addition, there is a total of 16.3 mgd coming from the Passaic River watershed. Since the water usage for 1970 is estimated at 96 mgd and for 1980 at 109 mgd, it would appear that supplies for these years would be adequate. However, there are certain local surpluses and inadequacies, so that additional developments will be needed in some areas.

Protection of Water Resources—Conservation of the present and potential water resources within the county is of paramount importance. Lands essential for the construction of dams and reservoirs must be protected from appropriations for other purposes. Underground waters must be protected by preventing overdevelopment of wells for unessential or wasteful uses.

Water Requirements

The increase in water demands during the past 25 years has exceeded materially the growth in population. Studies show that residential usage of water ranges substantially with climatic conditions and to a moderate extent with the level of prosperity. Industrial and business water usage is affected directly by the level of industrial activity. These and other factors must be considered in projecting forward the water requirements.

The apparent increase in water requirements during the past 25 years is considered abnormal as it contrasts the use during the decade of the greatest depression ever experienced in this country with that during the high-production war years and the following period embracing the highest level the national economy has reached. Other factors have combined to produce unusually high usage during the past few years. Mass development of homes in Bergen County has involved the removal of trees and extensive grading operations, followed by a modest covering of top soil and the replanting of grass, shrubs and trees. New homeowners have used extremely large quantities of water, much of it wastefully, to preserve grass and plantings, particularly during the recent series of hot dry summers. Where lawns are more shaded and firmly established in the older residential sections, the summer use of water for sprinkling

has been more moderate. Continued high usage is to be expected in newly developed areas but it is probable that as the construction of new subdivisions tapers off and plantings mature, the rate of use for sprinkling will moderate somewhat.

Air conditioning has spread rapidly since the war and has had a substantial effect on the use of water. Large commercial and industrial installations normally are provided with water from a private well or have facilities for cooling and recirculation of water, thus putting no large additional load on the public water supplies. Smaller commercial installations quite generally use water from the public supply and waste it to the sewer without re-use. Speculative builders installing central air conditioning in new homes usually depend upon the public supply, providing no facilities for re-use. Small window units are air-cooled, requiring no water.

About 1.5 gallons of water per minute per ton of cooling capacity are required for water-cooled air conditioning equipment, but far greater water use frequently results from faulty or inferior auxiliary equipment. The Hackensack Water Company's studies indicate that usage for air conditioning reached rates up to 25 million gallons per day on its system during certain hot days in 1956.

The cost of supplying water to meet the seasonal demands for air conditioning is far greater than that of serving normal water requirements. Water systems throughout the nation are beginning to impose restrictions on use and to revise rate schedules so as to recoup the cost of serving this low load-factor requirement from the users of air conditioning rather than spread the cost over all customers. Ridgewood has an ordinance prohibiting the use of water for air conditioning units in excess of three tons capacity, without recirculation.

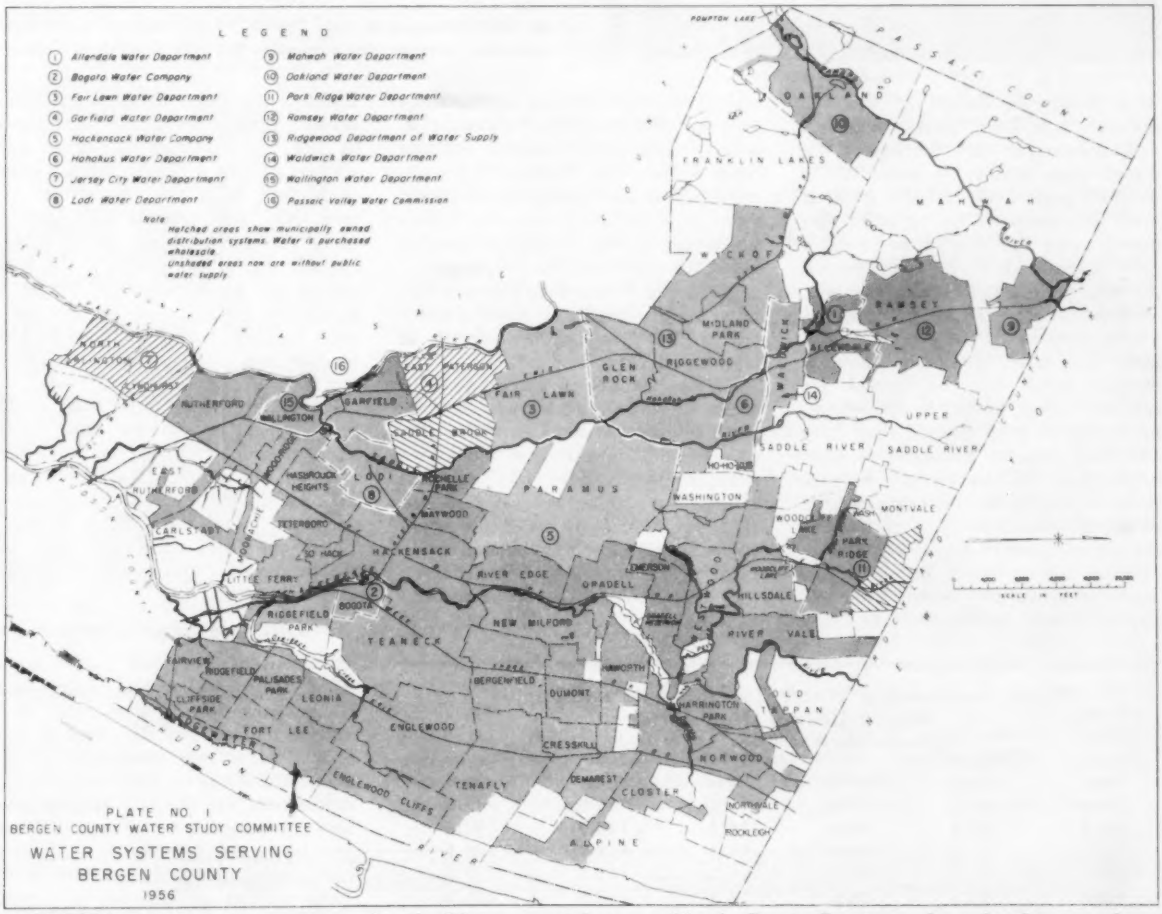
Wasted cooling water tends to overload sewers and increase the cost of sewage treatment and disposal. Already communities such as Hackensack and Englewood have ordinances prohibiting the discharge of cooling water to the sewers. Tenafly now charges $25 per year where cooling water is discharged to the sewers and Hasbrouck Heights will charge $7 per ton of capacity during an interim period pending complete elimination of discharge to sewers. Other communities also are imposing restrictions.

The spreading restrictions and increasing water costs are resulting in a trend to air-cooled equipment in larger-size installations. It is probable that within a decade, the use of water for air conditioning without facilities for cooling and re-use will be moderate.

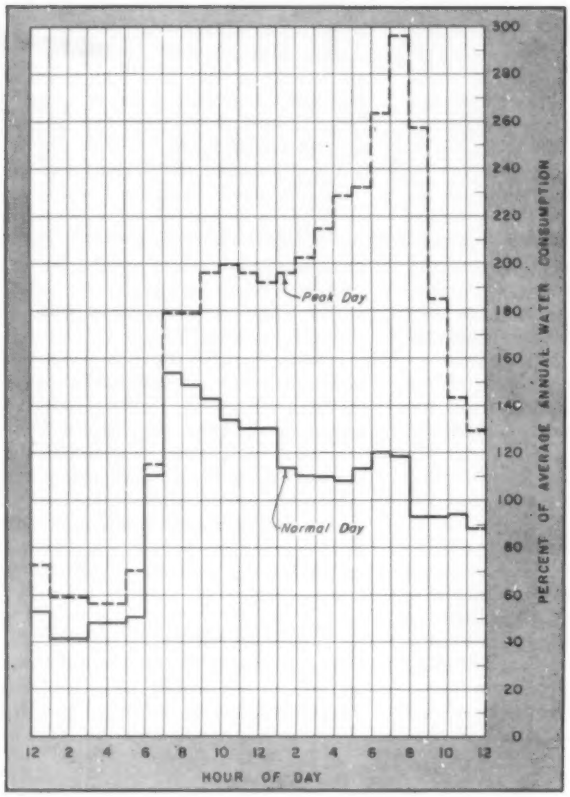
Modern appliances, such as dish washers, washing machines, home garbage grinders, multiple bathrooms, and swimming pools have increased domestic consumption moderately and may be expected to continue to do so. The increase however reflects enhanced living standards rather than appreciably greater usage resulting from the facilities themselves.

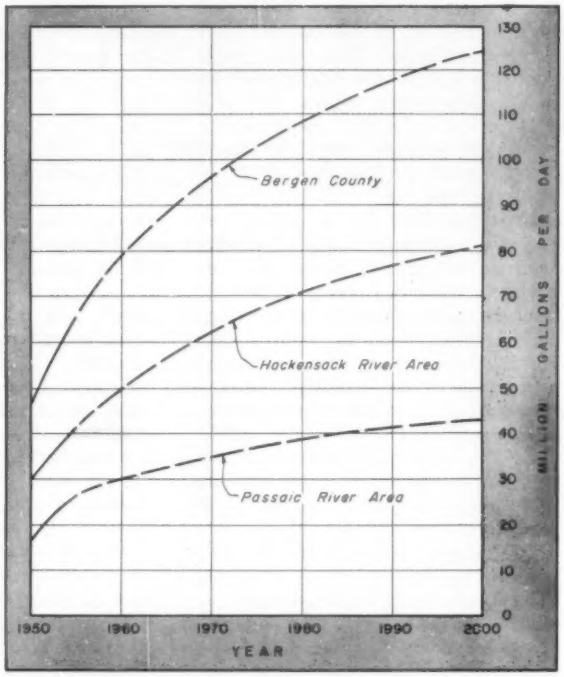
Water Service Deficiencies

The demands for water fluctuate constantly and widely, ranging from 25 percent of the average draft up



● **SIXTEEN water systems are now serving the 70 incorporated communities in Bergen County as shown by the map above.**





● **WATER requirements are shown above for all of Bergen County and for both the Passaic and Hackensack river areas.**

● **WATER usage at left: Typical hourly rates of water consumption, average and maximum days, in percent of normal.**

to demands in excess of the 585 percent, four-hour peak registered in Ridgewood in 1954. Storage on the distribution system is essential to meeting peak loads. At the least, it must be adequate to equalize demands over the maximum twenty-four hours with ample storage remaining for fire protection purposes. Preferably, it should be greater. Tanks must be of the proper height. Only the water available above a certain level will be useful for meeting peak loads, or otherwise, pressures on high ground may drop too low. Booster pumping to high areas may be necessary. Storage must be ample for, once the tank is emptied, service is likely to become almost completely disrupted. Transmission mains must be of ample capacity to convey water from the supply source to the centers of use and to refill distribution storage during the night hours. Capacities of mains, tanks and elevations of tanks must be balanced. Sources of supply, purification and pumping facilities must be of sufficient capacity to supply water at the maximum demand rates, as regulated by the distribution storage. Reserve equipment also must be provided to maintain service in the event of breakdown of equipment or power failures.

Bergen County is traversed by a series of ridges and valleys extending generally in a north and south direction. Differences in elevations between the valleys and adjacent ridges run up to several hundred feet. Avoidance of too high pressures in the low lands and maintenance of adequate pressures on the hills under all loads conditions is difficult. The friction losses in transporting water through pipes increases rapidly with increased rates of flow. For instance, to convey one million gallons a day through a mile of 12-inch pipe, the loss would be less than five pounds per square inch. At a maximum hourly rate, 250 percent of the average, the loss would rise to 26 pounds, while at a maximum hourly rate of 585 percent, the loss would increase to 126 pounds per square inch, or double the pressure normally carried.

Curtailment of sprinkling loads and the inadequacies and local short-period failures of service which have occurred in certain localities during recent years have resulted from the above causes. These are local situations, each of which requires individual diagnosis and correction.

Table 1—Probable Water Requirements and Supply
Bergen County, New Jersey
(All quantities in million gallons per day.)

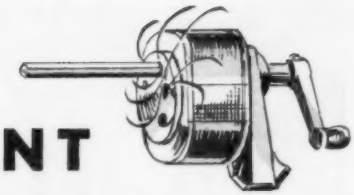
Year	Surface Supply	Wells	Outside County Sources	Total Supply	Requirements
1960	61.0	44.5	16.3	121.8	79.0
1970	59.5	44.5	16.3	120.3	96.4
1980	57.0	44.5	16.3	117.8	109.1
1990	53.5	44.5	16.3	114.3	117.6
2000	51.0	44.5	16.3	111.8	124.0

Ultimate Requirements

Presently developed water supplies from wells and from the Hackensack River now total 88.5 million gallons per day, and in the near future will be increased to about 105.5 million gallons per day. Adding thereto the 16.3 million gallons obtained from Passaic River developments outside the County gives total available capacities of 104.8 million gallons per day now

(*Continued on page* 190)

AN APPROACH TO MEASUREMENT OF CIVIL ENGINEERING PRODUCTION



JOHN W. SULLIVAN,

Senior Administrative Assistant, Department of Public Works, Bureau of Engineering, Los Angeles, California

THE PUBLICATION of the Hoover Commission report in 1951, advancing the term and principles of *performance budgeting*, gave great impetus to the examination of activities and operations within all phases of government with an eye to measurement and accountability.

The most common means, adopted by many government agencies for measurement of their activities, are policies of cost accounting of work measurement by the utilization of the man-hour/work unit. In Southern California, the cost accounting method is used by the City of San Diego and the man-hour/work unit by the City of Los Angeles. However, in each case, there are certain activities labeled as non-measurable and engineering as a function is included in this category.

Any query as to the measurability of engineering as a function is usually resolved with: "How do you measure the time it takes a professional engineer to decide upon the requirements, restrictions or creation of the design of a street, sewer or a drainage structure?" It is acknowledged that such jobs of an indeterminate nature are of that class of non-measurable activities, that is, non-measurable to the point of economic feasibility. However, is this job any different than that of a tool engineer or a cost accountant?

Application Of Measurement Techniques

Industrial engineers have repeatedly designed and organized means of measuring activities in factories and shops; office management analysts have also designed means of measuring paper work costs in many varied installations. The activity within a shop is concerned with a profit motive and the production of a sales item but the activity in the office is strictly a cost item.

Can these be compared to the design and construction of a public works project?

1. *Factory production* versus *construction*:
   In factory production cost per item (or per thousand) equals costs of materials plus cost of manufacturing plus overhead. In construction cost per square yard of pavement, cost per cubic yard of concrete placed plus engineering.
2. *Overhead* versus *engineering*:
   Overhead equals required office work, (sales, advertising, paper work) plus installation. Engineering equals design plus service units.

The American Public Works Association and the American Society of Civil Engineers have published books and articles concerned with the measurement of construction that are almost universally accepted by government and private contractors.[1] On the other hand it has been stated that the creative work of an engineer is un-measurable.

Breakdown of governmental engineering operation: Let us assume this basic idea of creative engineering being practically unmeasurable is correct, but on the other hand let us analyze the activities within an engineering organization. Universally, a design unit is divided into sections and these divided into smaller units called squads. This last unit is the primary division of work operation, that is, in most instances the squad in its entirety is working on one or two jobs. The composition of a squad is usually:

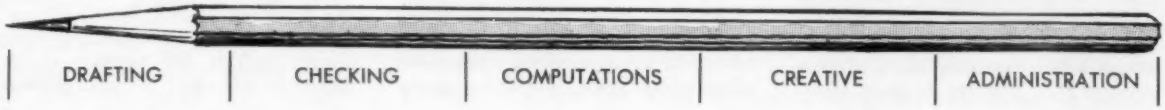
Squad leader—registered professional engineer.
Asst. squad leader—in the last steps toward becoming a professional engineer.
2 Asst. Engineers—College graduates in the first steps toward professionalism.
2 Draftsmen (or aides)—performing service work.

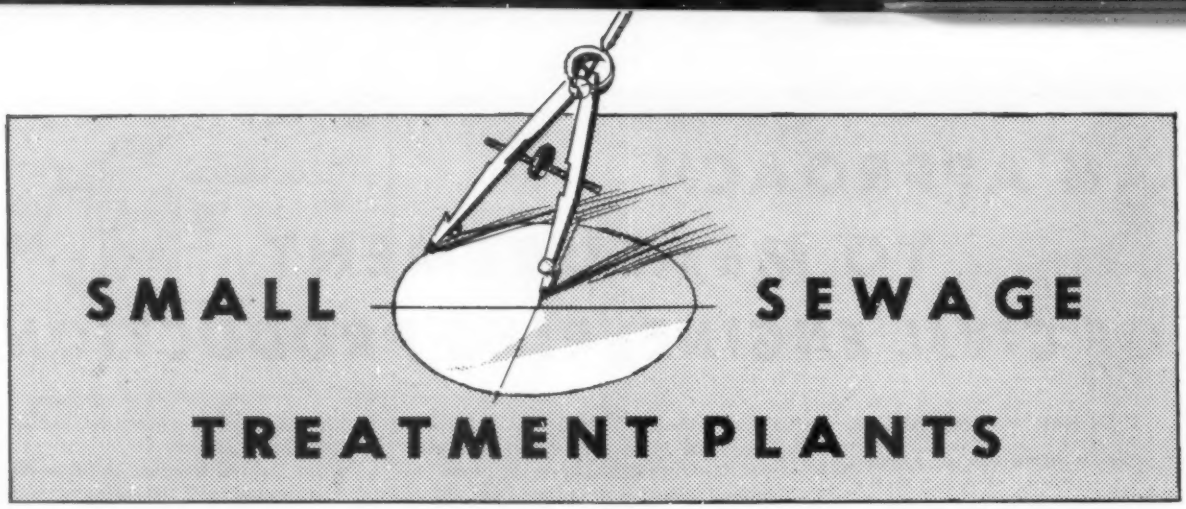
It can be stated that only the squad leader is entirely devoted to either supervision or creative work. Likewise, usually only the draftsmen are engaged entirely in performing a routine service function. If we say that the assistant squad leader is performing 60 percent in a service capacity and the assistant engineers are performing 90 percent as service functions, we get a division of work within the squad, on the basis of a forty-hour week, as follows:

Squad member	*Non-service work*	*Service work*
Leader	40 hours	
Asst. Leader	16 hours	24 hours
2 Asst. Engrs.	8 hours	72 hours
2 Draftsmen		80 hours
	64 hours	176 hours

Therefore it can be said, 73 percent of the squad's activity is directed toward service or routine functions and 27 percent is in the realm of creative activity. These figures will vary from organization to organization but as the usual criteria of the necessity for two to two and one half draftsmen per engineer and the normal functions of any squad leader includes some drafting, computations, checking and routine report writing, it is believed that these percentages are very liberal to the creative activity generally found within a design squad.

(*Continued on page* 194)





Applications, Design Requirements, Design Data and Treatment Processes

A review of the special problems involved in the design of sewage treatment facilities for small communities and for institutions, camps and resorts, developments, shopping centers and similar places.

JOHN J. BAFFA

Consulting Engineer, New York City

TREATMENT PLANTS with sound bases of design are necessary for treating the domestic sewage discharges from a variety of places other than the larger municipalities, for instance: (1) Industrial establishments; (2) commercial establishments; (3) institutions; (4) camps and summer resorts; (5) housing developments; and (6) small municipalities. Also, the present day practice of industrial dispersion finds many industrial establishments in suburban areas outside of the reach of municipal sewerage systems. The same is true for commercial establishments such a large suburban shopping centers and parkway restaurants. In unsewered areas may be found such institutions as hospitals, homes for the aged or disabled, summer camps, hotels, motels and trailer camps. The movement of populations to the suburbs often requires that sewage treatment be provided for housing developments. Several thousand small municipalities in the United States with public water systems are currently unsewered and most of these need sewage treatment facilities.

Characteristics of Small Plants

The peculiarities of small plants lie in the fact that all phases of their cost, administration, design and operation tend to approach the extremes of the ranges of the yardsticks which measure the performance of such matters. In most cases, the purchasers or owners of small plants become involved in such a situation only once in a lifetime or have only a profit motive. In the field of design, the handling of low flows requires ingenuity in design of small conduits and structures, to prevent deposition of solids and septic conditions. In some instances wide flow and quality variations may be experienced. In former years, the mechanical equipment available for small plants was extremely limited. Recently many equipment manufacturers have brought forth equipment specifically suited for the small plant. Of major importance in making designs is the necessity of recognizing that many small installations are characterized by part time supervision, by unskilled maintenance and in some cases by neglect. This means making everything as simple and as fool-proof as possible. Since contracting firms in rural areas are often inexperienced in treatment plant construction, simplicity of design, extremely detailed plans and specifications and engineering supervision of all details of construction are required. Other characteristics of small plants may include the need for compactness due to limited available space and the need for locating the treatment plants relatively close to habitations.

Population Ranges

"Small" sewage plants may be grouped into the approximate ranges of population and sewage flow shown in Table 1.

An upper limit of 250,000 gallons per day has been considered as indicating small sewage treatment plants. This is not a hard and fast figure since this upper limit does not permit exact definition. It is approximately at or below this level that the characteristics of small plants will most frequently occur. It is also up to this approximate limit that treatment plant equipment has been developed by some manufacturers with the thought of meeting the requirements of "small plants." In the case of small municipalities a lower limit of 500 persons is believed to represent the approximate

Table 1—Sizes of Small Sewage Treatment Plants

Service	Population	Capacity, gpd
Industries	up to 2500	up to 250,000
Commercial Establishments	up to 5000	up to 40,000
Institutions	up to 4000	up to 250,000
Camps & Summer Resorts	up to 2500	up to 250,000
Housing Developments	up to 2500	up to 250,000
Small Municipalities	500 to 2500	25,000 to 250,000

normal lowest practicable limit for municipal financing of public water supply and sewerage. A lower limit for small plants using regularly available and manufactured equipment may be set in the vicinity of 50 population or 5000 gallons per day.

Design Period

The choice of design period is of basic importance since all plant components are affected. In general, it may be said that it is uneconomical to design a treatment plant for too large a capacity. For all except municipal installations, the most frequent procedure is to provide for only immediate and definitely foreseeable future needs. In the case of municipal installations, sewage flows should be projected 10 to 25 years into the future. Costly components such as outfall sewers are commonly considered for 30 to 50-year design periods. In considering the design period for municipal installations, factors to be considered include interest rates, value of money, rate of community growth and local State Department of Health requirements.

Some State Departments of Health require design periods as follows for sewage treatment installations:

Colorado: Estimate population 15 to 25 years hence; provide for stage expansion; for institutions, state present and maximum anticipated capacity.

Connecticut: Make reasonable provision for future service; design sewers for 20 to 25 years in the future.

Florida: Give special consideration to ultimate capacity of institutions. Design sewers for 50 years.

New York: and other states have approved the Standards for Sewage Works of the Upper Mississippi River Board of Public Health Engineers and Great Lakes Board of Public Health Engineers. These states are Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, Pennsylvania and Wisconsin. The "Standards" recommend: That sewage treatment plants be designed to provide for the estimated population 15 to 25 years hence except for those units which can be readily increased in capacity; and that sewers and sewerage systems should be designed for the estimated future tributary population up to 50 years hence, except parts of the systems that can be readily increased in capacity. Similarly consideration should be given to maximum anticipated capacity of institutions.

South Carolina: 25 years for sewers and treatment plant.

South Dakota: Allow for future expansion in treatment plant. Sewers designed for 50 years.

Utah: 25 years for treatment plants. Maximum anticipated for institutions. 50 years for sewers except where readily increased.

West Virginia: 15 to 25 years for treatment plants. Maximum anticipated for institutions.

Wyoming: 15 to 25 years for treatment plants except where easily added to.

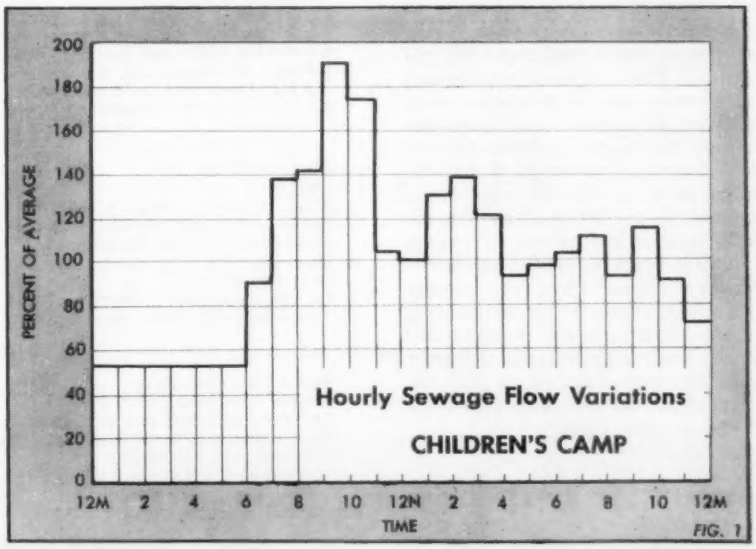
It will be noted that many states recognize the burden of large present expenditures for long design periods and the statement "except where easily added to" often appears. It is always desirable that the designer of treatment works provide space and means for convenient future enlargement.

Population Projection—For all except municipal installations, the design population is generally a fixed quantity or within a fixed range or can be arranged in fixed increments. In the case of municipal populations, a forecast is necessary. The writer prefers the use of methods based upon the theory of Verhulst which recognizes the saturation point. Factors to be considered include the probable growth of the community, the direction this growth will take, industrial growth and the effect of existing and proposed transportation facilities. The opinion of local real estate men, of the telephone and lighting companies and of local citizens are beneficial. Special problems arise in cases of summer or winter resorts where "on season" population may be as much as 1000 percent of "off season" population.

Sewage Flow

Sewage flows vary as to amounts per capita and as to hourly, daily, and seasonal variations depending upon the type of facility served by the treatment plant.

For existing installations it is best to measure the sewage flow and determine the hourly, weekly and seasonal patterns prior to design. Hourly or daily or seasonal peaks and minimum flows may control the hydraulic capacity of many plant elements including pipe lines, channels, wet wells and pumps. Treatment units will also be affected as to overflow rates, detention times



● **CURVE of sewage flow for children's camp follows the usual pattern for camps.**

and rates of application to biological oxidation units. Septicity under low flow conditions should be guarded against.

In Figure 1 are shown the hourly flow variations in sewage flow at a children's camp. The routines of arising and meal time activities are reflected in sewage flows. In Figure 2 are shown the hourly flow variations for an industrial establishment operating three shifts per day. The flow pattern is characterized by high day-time shift flows and heavy peaks reflecting washup activities prior to shift changes. In Figure 3 are shown the hourly flow variations for a typically suburban municipality on a winter day.

Where sewage flows cannot be measured for new installations comparison may be made with other similar installations. Consideration must be given to water consumption and its hourly, daily and seasonal variations. Some portions of water consumption may not reach the sewage treatment plant, but in some municipalities private water supplies add to water use which reaches the sewers. Industrial waste discharges can have major effect, particularly in small communities. Ground water infiltration should be considered. If a sewer system already exists, the flow in both wet and dry periods should be measured. If the project includes sewer construction the areas through which the sewer passes should be considered as to their water bearing characteristics.

Per capita design allowances for sewage flow for various types of establishments as contained in some State Department of Health Rules are shown in Table 2.

The Standards for Sewage Works previously mentioned say with respect to flow: "Unless satisfactory justification can be given for using a lower per capita flow, plans for sewage treatment plants to serve a new sewerage system for a municipality or sewer district will be examined on the basis of an average daily flow of 100 gallons per capita to which must be added industrial waste volumes. Plans for sewage treatment plants to serve existing sewerage systems will be examined on the basis of gaugings of the present flow from the sewers plus allowance for the estimated future increase in population."

Sewage Quality

Sewage quality must receive equal consideration with sewage flow. The total organic load, its characteristics and concentration variations must be established prior to design. Wherever possible, samples proportioned to sewage flow should be collected for not less than 24 hours and for as much longer as may be necessary to establish any particular characteristics.

Consideration of the characteristics of the water supply is desirable. This factor does not often affect sewage treatment plant design but it may on occasions. Excessive hardness, alkalinity, acidity or special mineral content should be noted.

The sewage from industrial and commercial establishments will generally contain a per capita contribution of 5 day BOD and suspended solids of about 1/3 the values normally associated with domestic sewage. The sewage from restaurants will be high in grease content and detergents. Sewage from institutions is generally highly concentrated and high in volatile content.

Municipal sewage should be checked for industrial wastes and the contents, volume and schedule of discharge of such wastes must be given detailed study. This is particularly true in small municipalities where a small volume of concentrated waste may contribute much

Table 2—Per Capita Sewage Flow Design Allowances

Type of Establishment	*Gallons Per Day Per Person*
CONNECTICUT	
Municipalities	100
Institutions	125-200
Dwellings	60
Day Schools (without showers & kitchens)	12-15
Factories	25-40
FLORIDA	
Small dwellings and cottages	50
Large dwellings with numerous fixtures	75-100
Rooming houses	40
Boarding houses	50
Hotels with connecting baths	50
Hotels with all private baths (2 persons per room)	60*
Restaurants (toilet and kitchen wastes per patron)	7-10
Restaurants (kitchen wastes per meal served)	2½-3
Tourist camps or trailer parks with individual bath units	50
Resort camps (night and day) with limited plumbing	50
Luxury camps	100-150*
Work or construction camps (semi-permanent)	50
Day schools without cafeterias, gymnasiums or showers	15*
Day schools with cafeterias but no gyms or showers	20*
Day schools with cafeterias, gyms and showers	25*
Boarding schools	75-100
Day workers at schools and offices	15
Hospitals (per bed)	150-250
Public institutions other than hospitals	75-125
Factories (gal. per person per shift, exclusive of industrial wastes)	15-35
Public picnic parks (toilet wastes only)	5
Picnic parks, with bath house, showers and flush toilets	10
Swimming pools and bathing places	10
Luxury residences and estates	100-150
Country clubs per resident member	100
Country clubs per member present	25
NEW YORK	
Municipalities	100
Camps	25-75
Small dwellings, farm houses, summer cottages, etc.	40-60
Large dwellings, boarding schools, etc. (numerous fixtures)	75-100
Institutions (except hospitals)	75-125
Hospitals	150-250
Day Schools	15
Day Schools with showers	20
Factories (per person per shift)	15-35
OTHER VALUES*	
Motels, per bed space	40
Motels with bath, toilet and kitchen wastes	50
Drive-in theaters, per car space	5
Movie theaters, per auditorium seat	5
Airports, per passenger	3-5
Self-service laundries, per customer	50
Stores, per toilet room	400
Service Stations, per vehicle served	10

*Data provided by Professor John E. Kiker, Jr., of the University of Florida, for the U.S.P.H.S.

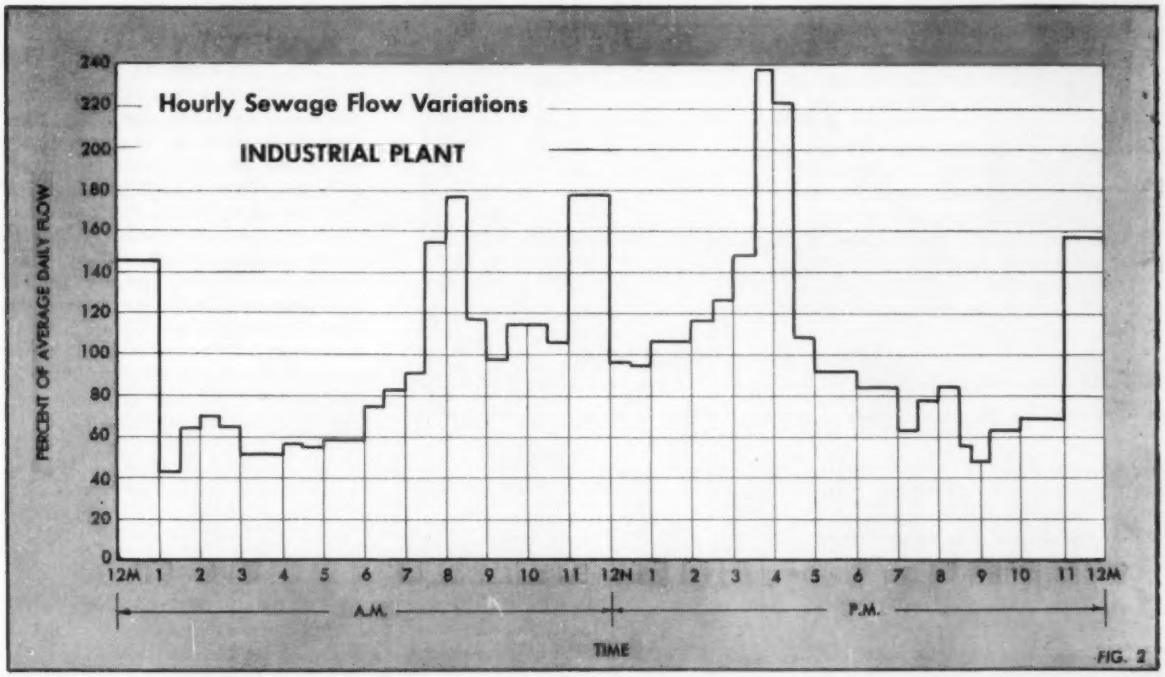
more load to the treatment plant than the domestic sewage.

Fig. 4 shows the percent of load arriving at a municipal treatment plant plotted hourly. About 85 percent of the organic load reaches the treatment plant in 16 hours.

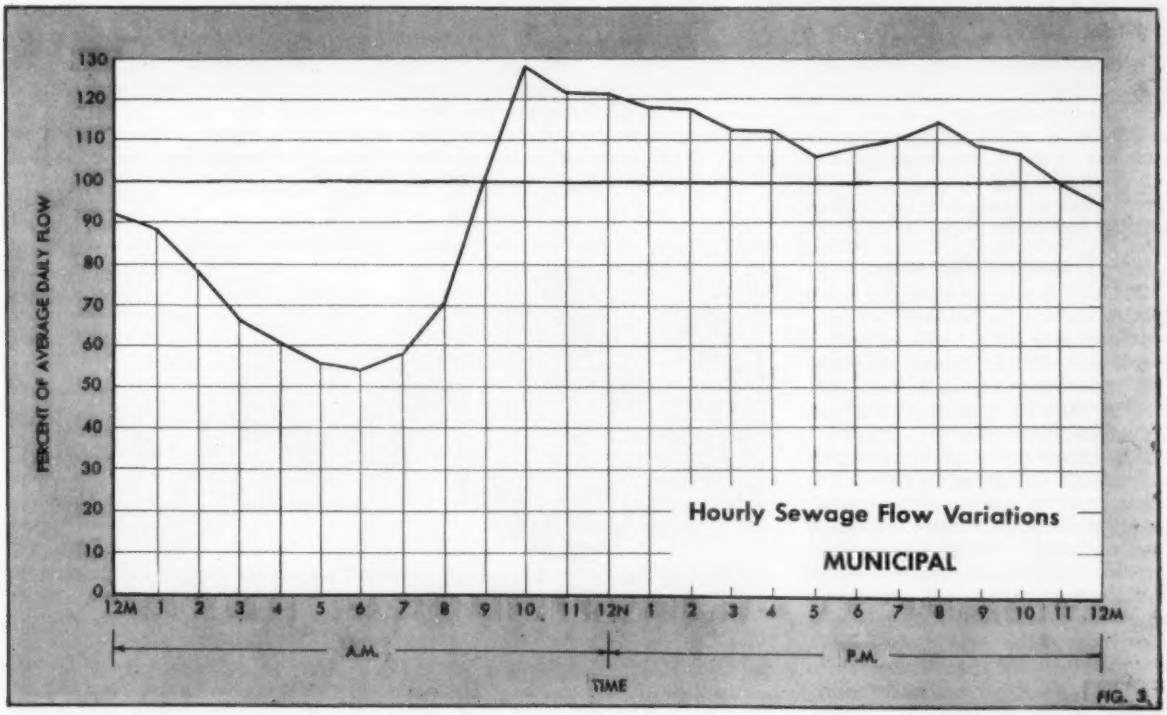
Various special conditions may affect the design of small treatment facilities. These special requirements are peculiar to the type of establishment served.

The sewage treatment facilities serving industrial and commercial plants must be designed to prevent frost damage during night, week end and holiday shut-downs. During such shut-downs biological flora must be maintained active. Plants serving summer camps or resorts must be capable of winter shut-down without undue maintenance.

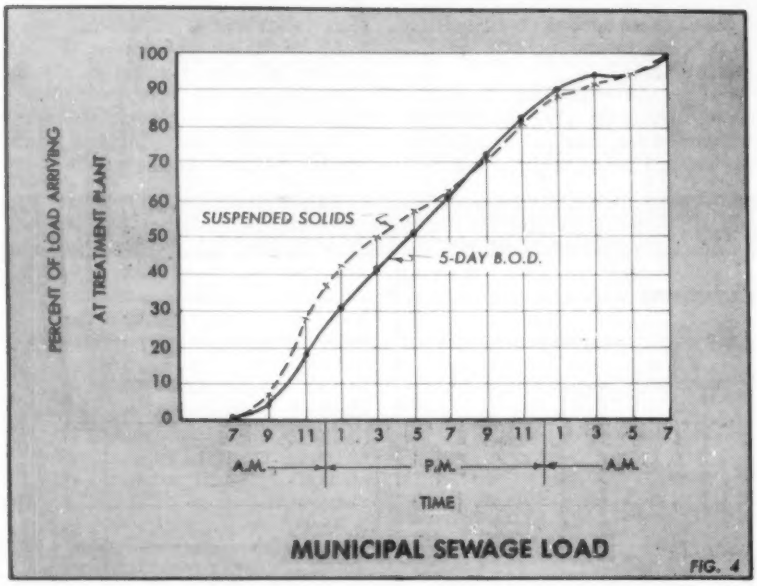
The problems of treatment plants serving housing developments stem



● SEWAGE flow from industrial plants may be influenced by the plant processes used as well as by size of the shifts.



● MUNICIPAL sewage flows generally follow the curve shown but may be influenced by infiltration and sometimes by weather.



● **CURVE shows cumulative load, in percent, arriving at sewage treatment plant.**

from financial considerations involving future uncertainty of the enterprise. From the standpoint of engineering design, the requirements usually boil down to designing a plant capable of expansion anywhere from one hundred to one thousand percent of initial construction. Low cost, compactness to conserve land and nearness to habitations are other factors normally present.

In the case of small municipalities, industrial waste discharges may constitute major problems. In the case of resort towns, the seasonal and week end sewage flow and load must be handled. The effect of existing or future garbage grinder installations and synthetic detergents must be evaluated. In all cases simple operation is mandatory.

Treatment Processes

Primary treatment units for small plants include bar screens or comminutors, settling and digestion units and sludge drying facilities. Effluent requirements, size of plant, sludge disposal problems, nearness to habitations, space and operating skills available will affect the choice of settling and digestion units. Settling units in common use include septic tanks, Imhoff tanks, two-story tanks offered by equipment manufacturers and mechanically cleaned settling tanks with separate sludge digestion. Two-story tanks are used to advantage in small plants starting at about 50 population, since settling and digestion are accomplished in one compact unit. These units also provide ample head resulting in elimination of sludge pumping. Digestion compartments can be heated.

Septic tanks are generally limited to small populations. The effluents require ample stream flow or may be applied to subsurface irrigation systems. Imhoff tanks may be used advantageously where treatment facilities are remote from habitations and odor will not cause a problem. At small plants digested sludge may be removed by scavenger firms though usually it it dried on sand beds.

Where secondary treatment is required at small plants, the processes in common use include intermittent sand filters, standard rate trickling filters, high rate trickling filters and activated sludge and modifications thereof. Sewage lagoons are also used for secondary treatment. Disinfection of small plant effluents is required in all cases and can be accomplished by hypochlorinators for small capacities or by vacuum type chlorine gas solution feed machines for the higher capacities.

Comments By State Sanitary Engineers

The following are some of the comments of State Sanitary Engineers in reply to a request for data on "Small" sewage treatment plants.

R. E. Novick of the Wyoming State Department of Health: "It is our experience that small treatment plants (communities 500 to 2000 population) seldom receive proper maintenance. This is one reason we favor lagoons for small communities wherever their construction is practical. Ease of maintenance should be a prime consideration in the design of small treatment plants."

Lynn M. Thatcher of the Utah Water Pollution Control Board: "In regard to sewage flows at small treatment plants, we have been plagued in Utah with large amounts of infiltration. As an example, at the Heber City plant which serves approximately 1400 people, the sewage flow varies .3 of a million gallons per day to 3.5 million gallons per day. At Vernal the sewer system serves a population of approximately 2,000 and the sewage flow during irrigation season was approximately 1,000 gallons per capita per day. Steps are being taken on all new sewage collection systems to insist upon tight joints and infiltration which will average less than 10,000 gallons per mile per day."

● **SMALL activated sludge plant serving the Villa Anna Subdivision in Louisville, Kentucky. This plant is a "rated aeration" plant with equipment by Chicago Pump Co.**

D. F. Smallhorst of the Texas Department of Health (with respect to low flow periods at housing subdivisions): "We have noted that oversized pumps will result in surging the sedimentation tanks."

T. A. Kolb of the South Carolina State Board of Health: "The design of small sewage treatment plants should be kept as simple as possible. Past experience has indicated that unless maintenance and operation are simplified, the tendency is to neglect the plant so that, in time, treatment is non-existent. This is due to the fact that most of the smaller communities are unable to retain a qualified operator for this purpose or do not realize the importance of proper operation."

C. H. Young of the Pennsylvania Department of Health: "With regard to special considerations in the design of small plants, it is advisable to encourage engaging competent experienced sanitary engineers to study these problems and prepare plans. It is as important to have good engineering on a small plant as it is for larger plants."

F. J. Laviviere of the New Hampshire State Department of Health: "Each installation actually is a study in itself with respect to quality and quantity of sewage."

W. W. White of the Nevada Department of Health: "In the past two or three years the Las Vegas development has included plants population-wise in the small plant classification, but contributions of sewage had to be determined on liberality of slot-machines, the appeal of the floor show and reputation of the cuisine. To this date the manner of designing such plants is outside any reasonable base. If a plan is submitted we start with a figure of 300 gallons per person per day for clubs larger than 300 rooms, 500 gpcd for clubs smaller than 300 rooms. Designing is difficult because these builders don't even know how many rooms they are going to build when they start construction; if the venture is successful they very likely double the units just before the last group are ready for occupancy."

Claiborne W. Brinck of the State of Montana Board of Health: "We in Montana have found that the sewage lagoon is the answer for our small communities."

F. L. Woodward of the Minnesota Department of Health: "Simplicity of operation and maintenance in selection of equipment and design of the plant should be kept in mind. Special attention should be given to the hydraulics of the plants. Unit sizes should be selected to compensate for the large variations in flow."

C. W. Klassen of the State of Illinois Sanitary Water Board: "We have not noted a great divergence in the strength and quality of sewage from small tributary populations as compared with the characteristics of sewage from larger domestic collection systems. In other words, about 0.15 to 0.20 pound of BOD and like quantities of suspended solids per capita are noted with the exception of schools and single eight-hour industrial shifts, in which latter case 1/3 of the above BOD and suspended solids per capita are employed. The most important considerations relative to satisfactory maintenance and operation of small sewage treatment works are not the technical, but instead they concern the acceptance of responsibility by a governmental unit or incorporated body in order that divided responsibility will not result in failure of the plant."

V. Anderson of the Idaho Board of Health: "Because small sewage treatment plants in general have very limited attention and in most cases from inexperienced persons who are sometimes disinterested, the design of a satisfactory small sewage treatment plant may be considered to be a more difficult problem than the design of a satisfactory large plant. Sewage lagoons as used in North Dakota and South Dakota appear to be a method for providing a high degree of treatment requiring a minimum of attention and at relatively low construction and operational costs. We feel that lagoons probably are the most satisfactory and economical solution to the sewage treatment problem of small towns in Idaho."

W. N. Gahr of the Colorado Department of Public Health: "It is my belief that special consideration as to simplicity of design with a view of trouble free operation should be foremost in the planning and designing of small sewage treatment plants. Cost of the plant is, of course, important on a per capita basis, but I believe that the foremost thought in the mind of the designer of small sewage treatment plants should be a simple plant to operate and maintain. Freedom from trouble should be the designer's watchword."

D. C. Kalda of the South Dakota Department of Health: "During the

Courtesy Infilco Inc.

● **AERO-Accelator plant serving Summit Park Sanitorium, Pomona, New York, has capacity of 22,000 gallons per day.**

Courtesy Chain Belt Co.

● **ATTRACTIVE small plant at Holes Corner, Wisc., showing final clarifier in foreground and digester at right.**

past three of four years the sewage stabilization pond has replaced the other types of treatment. The ponds have been found to be particularly suited to the conditions in our state and have become very popular. The costs are much less for both construction and operation and the degree of treatment is equivalent to that of complete conventional treatment."

J. E. Trygg of the State Department of Health of Louisiana: "Small sewage treatment plants are frequently a problem because of the difficulty in getting a competent operator."

G. L. Hall of the Maryland Department of Health: "We do not believe the use of some of the older types of treatment such as septic tanks, Imhoff tanks and similar units is advisable even in the smaller installations. The use of mechanical equipment in a treatment plant is beneficial since such equipment requires at least some operating attention. Over-simplified plants tend to encourage neglect at the treatment works. Under Wisconsin conditions and winter time temperatures, it is essential that treatment plants be operable with a minimum of increased attention. Special consideration, therefore, needs to be given to this factor."

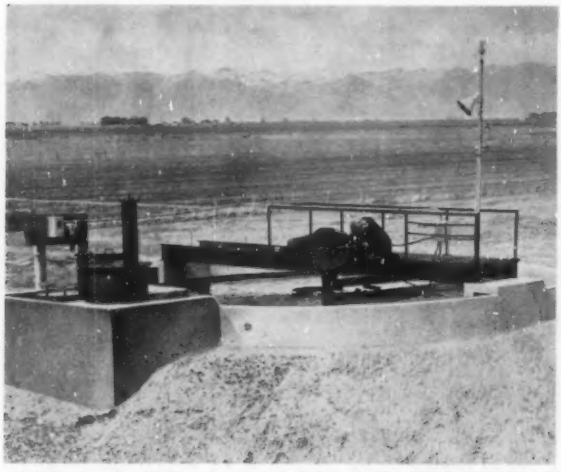
R. P. Lowe of the New Mexico Department of Health: "Under special considerations relating to the design of small sewage treatment plants, we consider that the installation of as little mechanical equipment as possible is an essential feature. This is due to the fact that the small town plant operators have a multitude of other duties in the community besides sewage treatment plant operation."

such units for the smaller plants.

J. R. Fleming of the State of Tennessee Department of Public Health: "In the design of small sewage treatment plants we attempt to work out means for reducing the operation problem as much as possible. We believe the more simple types of treatment and equipment work better in the small plants; otherwise there are no particular features of these small plants that we believe should differ from plants serving larger communities."

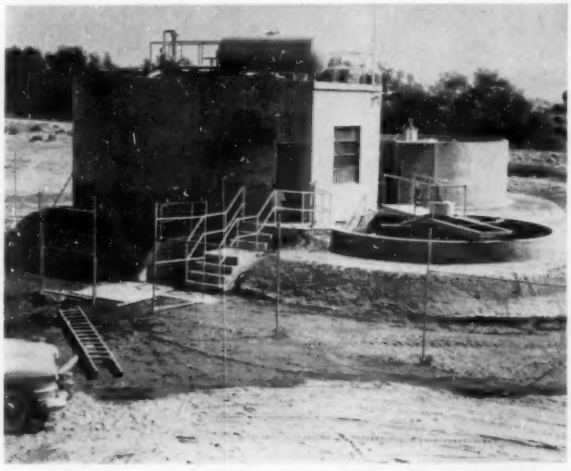
A. H. Fletcher of the State of New Jersey Department of Health: "This department treats the design of small plants in the same manner as that for all other sewage treatment plants. They are subject to the same rules and regulations."

D. K. Harmeson of the Delaware State Board of Health: "These small plants are operated by men who



Courtesy Dorr-Oliver Inc.

● **PRIMARY treatment is provided for a population of about 2,000 by this Dorr Clarigester at Center, Colorado.**



Courtesy Yeomans Bros. Co.

● **TRICKLING filter, Spiragester and Spiraflo units provide treatment for 500 people and a school at Thermal, Calif.**

mechanically cleaned settling tanks and mechanically equipped sewage treatment plants in the smaller installations has generally resulted in better plant efficiency than have some of the older types of treatment units. Some of the smaller plants have required sand filtration because they are located on extremely small watersheds but in general we are not entirely favorable to the use of such filters since the operation and maintenance problems on them are rather laborious."

O. J. Muegge of the Wisconsin Board of Health: "Special considerations relating to design of small plants include simplified controls and mechanical equipment to permit non-technical personnel to operate the plant. We have found, however, that the presence of some mechani-

B. A. Poole of the State Board of Health of Indiana: "Actual flow measurements and sewage characteristics are requested with design data. Consideration should be given in the design for installation of household garbage grinders."

J. M. Jarrett of the North Carolina Board of Health: "It has been observed that designing engineers have considerable difficulty proportioning grit chambers so as to maintain proper velocities during periods of average and low flows. If the channels in the grit chambers are made small enough to maintain proper velocities they are then too small to be easily cleaned and are therefore likely to create objectionable odors and other problems. We believe that special consideration should be given to the design of

have little training in this regard and who may have several jobs in the community. Therefore, we feel that the design should be as little complicated as possible and should embody features facilitating the ease of operation."

G. E. Mau of the Kansas State Board of Health: "There has been a trend established in the last couple of years to the design of more separate sludge digestion plants. There are two main reasons for this trend. One is the increased use of garbage grinders for which load an Imhoff tank is not particularly adapted, and the other reason is that Engineers are observing that costs for separate sludge digestion plants are in many cases no greater and frequently less than for similar Imhoff tank installations.

ELECTRONIC COMPUTERS

Can Help CITIES and COUNTIES

L. R. SCHUREMAN,
Highway Engineer,
Bureau of Public Roads

DURING the past year, extraordinary progress has been made in the application of electronic computers to highway engineering operations. Initial skepticism has given way to confidence, and mild interest to enthusiasm as the potentialities of this remarkable device have become more widely recognized.

Following the lead of Arizona, California, and the Bureau of Public Roads, State after State has found electronic computation to be a most effective means of increasing the productivity of its engineering force. At the present time, thirteen State highway departments have electronic computers and are using them in their day to day engineering operations. More than twenty other States have computers on order and are awaiting delivery of them. In addition, a number of consultants are using electronic computers and are participating in basic development work.

With electronic computation well on the way to becoming "conventional" procedure in the States and in consulting firms, the question arises, "What about the cities and counties—how can they take advantage of the increased operating efficiency attainable through the use of electronic computers?"

There are a number of ways in which this can be done. The volume of work in the larger cities and counties may be adequate to justify the installation of a computer, either for use on engineering problems alone, or for a combination of engineering, accounting and statistical computations. Cities and counties which cannot justify or support the installation of a computer, can make use of facilities available at service bureaus on an hourly or unit charge basis. This service is now available in about twenty of the larger cities throughout the country and should be available in about twice that number by the end of the year. Similar service can be obtained at a number of universities which have electronic computers. In addition, some

● **ONE OF the types of computers available. This is the Burroughs Model E-101.**

of the State highway departments which have computers or expect to install them, are planning to provide computer service for their counties. It seems probable that this plan will be extended to cover cities and that other States may also find it possible to offer such service as their computer work loads become more clearly defined.

In any event, unless they have followed closely the developments in the highway field during the past year, many city and county engineers will want to know what electronic computers are, how they work, what computations can be made on them, what their advantages are, how they can go about using them, and how much it will cost. In the discussion which follows, information is provided on these points and on other aspects of computer usage which may be helpful to city and county engineers.

The Electronic Computer

Electronic computers are of two general types, analog and digital. In the analog computer, quantities or physical conditions, such as pressure, temperature or flow are represented by analogous electrical quantities. The digital computer, as its name implies, works with digits or numbers. Either type of computer may be designed for a special purpose or may be designed for general usage. The general purpose electronic digital computer is best suited to highway engineering work and is the type which has been used for all applications to date.

This type of computer is extremely versatile and performs arithmetic operations at prodigious speeds with an accuracy dependent only on the number of decimal places used. It can add, subtract, multiply and divide. In addition to these operations, it can follow automatically a predetermined sequence of operations, it can compare two numbers and follow either of two courses of action depending upon which number is the larger, and it can record and retain numbers in its "memory" for use as needed.

The Computer Program

In order to use the computer for the solution of a problem, it is

● IBM 650, a magnetic drum data processing machine, is widely used by engineers.

necessary to place in it a prepared series of detailed instructions which governs its operations, and their sequence, in solving the problem. This is called a program. In developing a computer program for any particular type of problem, the problem must be resolved into its component parts, and these parts further resolved into elementary mathematical operations, all arranged in proper sequence for the solution of the problem. The program is translated into the code (usually numerical) used by the particular computer involved, carefully checked, and is then ready for use. Depending upon the complexity of the problem, the preparation of the program may take weeks or months. However, once completed and checked, the program, expressed in coded form on tape or cards, or wired on control panels, can be placed in the computer in a very short time. It can be used over and over again, year after year, whenever that particular kind of problem is to be solved. As many programs as desired, covering a wide range of problem types, may be developed for the same computer, so that in a single day a number of different problems either of the same type or of different types may be solved.

Because of the time required to prepare a computer program, it is not economical to use the computer for one-time problems except in cases where it would take longer to solve the problem manually than to prepare the program. Greatest advantage is obtained from the use of the computer for problems which recur frequently and for those for which the time and cost required for manual solution would be prohibitive.

By dividing program development work among the highway departments and other agencies involved and distributing the resulting programs to all users, the burden of preparing programs can be reduced to a minimum. This is being done in the highway field, with the Bureau of Public Roads serving as the collecting and distributing agency.

In addition, a program library is being established in the Bureau. One of the principal functions of the library is to maintain, in current status, copies of all programs developed in the highway field for distribution to highway agencies on request. In this way duplication of effort will be minimized and program development will be advanced at a considerably faster rate than otherwise would be possible.

Types Of Problems

To date, computer programs have been developed and are being used for survey computations, centerline grades, clearing and grubbing acreage, roadway earthwork quantities, borrow pit excavation quantities, structural and geometric computations for bridges, traffic studies, bid tabulations and analyses, sieve analyses of soils, and the computation and tabulation of bridge reinforcement steel quantities.

The programs for survey computations cover latitudes and departures, unknown lengths and/or bearings, error of closure, traverse adjustments, coordinates, and areas for closed traverses. Programs are being developed for the interconversion of geographic coordinates and plane coordinates and for the adjustment of triangulation and level networks.

For centerline grades, the program permits computation as a continuous process through vertical curves and station equations.

The programs for roadway earthwork quantities include the computations of cut and fill volumes for design purposes, for plan quantities and for final payment. For earthwork quantities at the design stage, the input includes the cross section data, centerline grades, and design template data with provision for superelevation, curve widening, and varying side slopes. The computer produces a tabulation of the cut and fill volumes by station and the difference between them adjusted for shrinkage or swell, the cumulative volumes of cut and fill, mass diagram ordinates and slope stake coordinates. For the computation of earthwork from staked cross sections, the procedure is similar except that slope stake coordinates are not included in the computer output. When final cross sections are used, the computer input consists of the original and final cross sections. A similar procedure is used for computing borrow pit excavation quantities.

In bridge design, programs have been completed for computing the controlling dimensions and seat elevations for multispan skewed bridges on curved alignment with nonparallel piers or bents, for continuous beam bridge and truss deflections, for composite beam design, for the design of continuous steel beam bridges of 3, 4 or 5 spans, and for parts of the computations involved in the design of suspension and cantilever bridges, arches and rigid frames. Programs are being developed for the computations involved in the structural design of viaduct bents, abutments, retaining walls and continuous reinforced concrete bridges.

The programs for traffic problems cover the analyses of origin and destination survey data including development of trip desire charts, prediction of future traffic distribution, assignment of traffic to a proposed new route or system of routes, and in the computation of benefit-cost ratios.

Other types of problems for which programs are being developed include sufficiency rating analyses, road life computations, an analytical method of checking contour maps produced photogramatrically and a number of structural problems. Areas not yet explored but which appear appropriate for electronic computation include the calculation of runoff for use in the hydraulic design of highway bridges and culverts, backwater computations, storm drain design, structural design for box culverts, acci-

dent analyses, parking studies and various problems susceptible to analyses by statistical methods.

In addition to programs for specific problems, standard programs, called "subroutines", have been developed. These include the determination of square root, sine, cosine and tangent, the solution of simultaneous equations, simple and multiple correlation analyses, regression analyses, and other problems which are components of many engineering problems. Subroutines can be incorporated in any program as a complete unit thus simplifying the preparation of programs involving such mathematical operations.

The electronic computer is also used for payroll preparation, distribution of costs by fund and account, inventory problems, statistical analyses and other problems of general application.

Some work has been done on the development of computer programs for reservoir regulation, unit hydrograph computations, flood routing computations, and the analysis of water distribution systems. Complete programs for these problems should be available within the near future.

Advantages of Electronic Computation

Very substantial savings in time and cost are being made through the use of the electronic computer for these computations. In survey computations, the time required for the computer method, including the preparation of the punched cards or tape carrying the input data, is about 20 percent of the time required using conventional methods. The cost is about 40 percent of the cost by conventional methods. In grade computations, the time required for the computer method is about 25 percent of that required by conventional methods. In the computation of earthwork quantities, the time required for the computer methods, including the preparation of input data, ranges from 5 to 10 percent of the time required for the plotting and planimetering method. Data on relative costs are not complete but rough estimates indicate that the cost by computer methods is from 20 to 25 percent of the cost using conventional methods. In structural design computations, the use of the electronic computer saves about 75 percent of the cost of equivalent calculations performed in the usual way, with an even greater saving in designer's time.

In addition, the use of the computer makes possible more thorough analyses through a wider range of investigations thus leading to more refined designs. This is particularly true in highway location and design and in structural design. A further substantial advantage of electronic computation is that problems involving large masses of data, such as certain types of traffic studies, for which the time required for solution by conventional methods would be prohibitive, can be completed in a relatively short time on the counter. This is also true for some types of structural problems.

The use of an electronic computer relieves engineers and engineering assistants of the drudgery of routine computation and permits them to spend their time on work for which their training and experience can be used to best advantage. In this way the productivity of the engineering force can be increased substantially. The savings in time which are cited are savings in total time. Since the preparation of input data and the operation of the computer can and should be handled by non-engineering personnel, the saving in engineers' time is actually a hundred percent with respect to the computation performed by the computer.

While the computer does not make errors even though it may run steadily for long periods of time, it will not produce correct results if there are errors in the input data. For this reason, field notes and other source material must be clearly written and card or tape punching must be carefully verified before the computation is begun. It is important to remember that the computer cannot think—it can only do what it is directed to do by the program instructions and the results it produces are only as good as the data it is given to work with.

Cost of Computers

Electric computers can be installed on either a purchase or rental basis. They are available on either basis in a range of sizes and costs with corresponding variations in versatility, speed and capacity.

The small computers are desk size and cost under $50,000. Rental rates, which include maintenance, range from about one thousand to fifteen hundred dollars a month. These computers are capable of handling practically all types of highway engineering problems and are adequate for a fair sized volume of work.

The intermediate size computers are larger and faster, and range in cost up to about $400,000. Corresponding rental rates, including maintenance, range from about four thousand to eight thousand dollars a month. One of these computers can handle any highway engineering problem and is adequate for the work of any of the States.

The large computers generally require the space provided by an entire room and cost $1 million or more.

There is no "rule of thumb" which can be used to determine

● **BENDIX G-15 computer can reduce engineering personnel needs and speed work.**

● DATATRON computer by Burroughs can be used for many engineering jobs.

when the installation of a computer is economically justified. Each case must be judged individually on the basis of program requirements, engineering force, available funds, and other pertinent factors.

If the installation of a computer is not feasible, then computer service can be purchased.

Computer Service Available

As mentioned previously, computer service is available at service bureaus, universities, and at some of the State highway departments on an hourly or unit charge basis. In other words, cities and counties can purchase electronic computation in much the same way that they can purchase blueprinting or mimeographing service. The charge for computation on an intermediate size computer will range up to about a hundred dollars an hour. However, in that hour, a great deal of computation can be completed. For example, earthwork quantities can be computed at a rate of about five or six miles of road per hour.

Service bureaus are equipped to prepare the punched cards or tape for computer input from field notes or problem sheets and can arrange the output data in any form desired. Data can be transmitted to and from the service bureau or other computing facility by mail or in the case of problems such as those in structural design where there is very little input data, by telephone.

To avoid confusion, agreement should be reached in advance on the form in which the problem data should be submitted. Where State highway department facilities are used, the arrangement of field notes or problem sheets will be prescribed by the State in order to avoid exceptions to standard procedure in which personnel engaged in preparing punched cards or tape have been trained. Normally, very little change is necessary in the taking and recording of field measurements.

For earthwork computation, cards or tape can be punched direct from field cross section notes provided the height of instrument which applies to each section is clearly shown and the entries are clear and distinct. In addition, dimensioned design templates with the stations between which they apply, and criteria with respect to superelevation, curve widening and side slopes will be needed. For survey computations, a data sheet is used on which the measured lengths and bearings are listed in order. Where there are missing sides or bearings to be computed, they should be clearly designated. Basic data for structural problems can be given in any form provided they are complete and clear.

The results of the computer solution normally will be in the form of printed tabulations. For earthwork computation the form of tabulation is the same as that used when the computation is made by conventional methods, with each line identified by the station number. Plotted cross sections can be furnished at specified stations or plusses such as culvert locations and other points where they might be needed. Since plotted cross sections are not used in computing earthwork quantities, only a few will be needed, and these can be drawn at a smaller scale than normally used. Such cross sections can be plotted automatically at a rapid rate by an electronic plotter actuated by the punched cards or tape on which the basic data is recorded. Any special arrangements of output data desired should be obtainable without difficulty.

The advantages of electronic computation have been well demonstrated not only in reducing engineering costs and manpower requirements, but also in reducing substantially the time required to advance approved projects to the construction stage. These advantages are available to cities and counties to the extent that they wish to use them.

Computer programs filed in the program library of the Bureau of Public Roads will be made available for county and city, as well as State highway department use. In addition, it is expected that typical problems, arranged for electronic computer solution, will be made available in brochures together with limiting conditions, arrangement of input data, and form of output.

New Type of Fluorescent Luminaires

What is believed to be the nation's first installation of fluorescent lights using "Power Groove" lamps is under way at Muscatine, Iowa. The Muscatine Water and Light Department is using 12 General Electric Form 260S fluorescent luminaires to illuminate a municipal parking lot. A 75 percent increase in light is generated by the two-lamp, six-foot luminaires, raising the maximum to 18,600 lumens.

The "Power Groove" is said to make possible an 82 percent increase in light generated by the Form 204S luminaire, raising the output from 6,600 lumens to 12,000 lumens. Percentage increase is only slightly less in the Form 406S which now has a maximum output of 37,-200 lumens compared with a previous high of 21,200. The Form 204S is designed for the lighting of secondary traffic arteries, while the Form 406S is used for illuminating main streets, highways and toll plazas.

• BRIGHT FUTURE FOR A BIG CITY •

VESTA VICTORIA

FLASH BULBS popped, television cameras ground and city officials cheered on May 15th as the flick of a ceremonial switch upped illumination of Los Angeles' famous Wilshire Boulevard by 1000 percent, making it one of the brightest boulevards in the world. But the 808 new 20,000-lumen mercury vapor lamps at 404 locations are only another step in the race of America's third largest and fastest growing city to keep pace with her street lighting problems. Additional 10-year plans constitute one of the biggest lighting programs in the country, and call for $27,000,000 to rehabilitate and modernize hundreds of miles of major street lighting systems.

"We have 5500 miles of improved streets in the city," states A. T. Nadeau, Director of Los Angeles Street Lighting Bureau and originator of the master plan, "with only 1100 miles of electroliers to light them—not to mention the job of providing safe illumination for our freeways, the most heavily travelled in the world."

Cushing Phillips, president of the Board of Public Works, says: "Good street lighting is a positive factor in preventing dusk-to-dawn accidents and with adequate lighting nighttime accidents will be reduced to a rate about equal to that during the day."

● **PLACING one of the poles. This is 33 feet high and carries two specially angled brackets, as shown above.**

● **LIGHTING effect obtained by using 33-ft. poles with two 20,000-lumen mercury vapor lamps on each. Poles are 123 ft. apart. Light intensity was greatly increased.**

Biggest slice of the city's capital improvement budget, $16,000,000, will lighten up 200 miles of dark arterials. Another $3,000,000 goes to freeways. The remaining $8,000,000 will convert 7,804 obsolete metal and concrete posts along 81½ miles of streets, most of them the twin-light type which can be easily remodeled or replaced.

The initial Wilshire Boulevard facelifting typifies Director Nadeau's plan to convert and conserve. By combining new equipment with present usable stock he has made a quick change-over and saved money as well. The 404 twin-unit installations, for example, cost only $670 per pole.

Installing New Lights

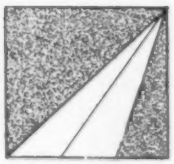
Most of the job went through without a hitch. Electric and Machinery Service, Inc., low bidders, salvaged the original King cast-iron bases from their 24-ft. shafts and machined them out to hold the new 33-ft. Union Metal pressed-steel shafts. Adaptations of General Electric Form 101R luminaires were attached to 4-ft. brackets and angled to give each fixture its most effective direction, then extended two feet toward the street center line, averaging 123 ft. apart. The new luminaires give ten times more light than the former 15,000-lumen single-lamp incandescents, whose ornate bronze-lanterned electroliers had been tourist landmarks for 30 years. They cost $1,000 apiece, even in 1928, when steak was high at 35¢ per pound.

Most pressing problem these days is the replacement of "the concretes" —more than 5,000 obsolete lighting posts. These have their counterparts in out-dated metal electroliers scattered through 25 miles of central sections. These are of the old five-light cluster type supported by heavy metal arms about 10 feet high.

A Brighter Future

The future looks brighter. A 78 single-lamp installation similar to the Wilshire project is now in operation on Los Feliz Boulevard between Riverside Drive and Vermont Avenue, both heavy arteries. More lighting and remodelling projects in busy sections are coming up for immediate bids. North Hollywood's Lankershim Boulevard, through which much traffic flows on its way north on Highway 101, will get 57 more lights. Hollywood Boulevard's "glamor program" is on the sketchboard for construction next year.

Meanwhile after 33 years in the Lighting Bureau Director Nadeau sees the race getting faster and faster. He knows his city; he watches it spilling out over 400 square miles, spreading bigger every day, growing so fast that even now only 25 percent of its streets are adequately lit. And as he looks at his $27,000,000 ten-year budget he thoughtfully scratches his head.



HIGHWAY PLANNING for the SMALL CITY—

Solving the Traffic Problem

JACOB MENDE

FACTS are valuable not for their own sake, but as a means to an end. The small town engineer who has made basic land use, population density, and traffic studies in his community will have an impressive file of maps, charts and tables. These should be treated with respect, but it must be remembered that they are simply tools to help in the vital job of planning a highway system which will solve the area traffic problem.

The first step in solving a problem is to define the problem. This is not always so easy as it seems when traffic congestion is involved, due to the many variables and unknowns. It is advisable to follow an orderly procedure which will focus attention on the major defects in the street system, and therefore point the way to a possible remedy. These four questions should be asked:

1—Which streets are now overloaded and how much?

2—Which streets will be overloaded at the end of the forecast period and how much?

3—What is the composition of the traffic stream on the streets that are now overloaded?

4—What will be the composition of the traffic stream on the overloaded streets at the end of the forecast period?

The answers are obtainable from the results of the comprehensive traffic survey:

1—The peak hour volume map will give the answer to this question. The plotting of peak volumes vs. street capacities will tell the story, showing the work-horses of the street network.

2—As in Item 1 above, the answer is told by the traffic volumes plotted against street capacities. This study, however, shows the future traffic pattern based on the expected changes in the development pattern. If any one tool in the engineer's kit can be called vital, the forecast peak hour volume map fits this description, because it is designed to help fit the highway of the future to the community of the future.

3—The answer to this question is obtained from the origin and destination survey. The Main Street station at the west city line, for example, showed the following traffic characteristics: To Zone 1 (Central Business District) 38%; to Zone 2 (Industrial Area) 15%; to Zones 3, 4, 5 (Residential Areas) 12%; to County Zones (Local Through Traffic) 15%; and to Other Zones (Long Distance Through Traffic) 20%.

4—This answer is not too readily apparent, and considerable judgment will be required to make the analysis. The basic reasoning behind a traffic forecast is that traffic will increase due to area growth and increased motor vehicle use. The forecast, then, is simply a factoring up process which allows for all the expected influences, but the distribution of this forecast traffic requires assignments to various streets on the basis of anticipated changes in development. The future O&D pattern may be expected to follow closely the development changes. Therefore, traffic now using Main Street to reach the city's only shopping district will split up into two traffic streams when the new shopping center is built, etc. The O&D survey will permit the engineer to make these traffic assignments.

THIS CONCLUDES the series of articles by Mr. Mende in which basic information is presented to guide the engineer of a small city in a realistic highway planning program. Maps of traffic routes, the first essential for sound planning, were discussed in PUBLIC WORKS for January, 1957. In the April issue the matter of traffic counts was covered, and the June article described steps to be followed in making origin and destination surveys. Now that we have our maps and figures on the number of cars to be planned for and have an idea where they are going, we are prepared to use these data to solve the traffic problem in the most practical way. This article tells how you should do it.

The Problem Defined

When the above four questions have been answered, the problem will be clearly defined as a two-phase problem. First, there will be an immediate and pressing need to relieve traffic congestion. Second, the facts will point to a future traffic problem that the small-town engineer will have to face if his ulcers and the Common Council let him hold his job that long. Tackling the problems one at a time, the engineer will be confronted with this type of situation:

Main Street is now theoretically overloaded some 150 vehicles per hour during the afternoon peak. This results in congestion in the business district. Customers of the local business establishments have extreme difficulty in parking, and through motorists have to wait for three and even four cycles of the traffic signal at Main and Broadway to get through the intersection. The signal timing is set at the maximum green for Main Street, and the ratio of the volumes on the two intersecting streets do not lend themselves to any more favorable type of signal installation. According to the O&D survey, only 38 percent of the traffic on Main Street really wants to get to the business district; the remainder could profitably be rerouted on other existing streets or a new facility.

There is a relatively simple and inexpensive way of getting through traffic off an overloaded street; namely, designating another street as the posted through route. However, the engineer should give a long, hard look at the city map and the peak hour volume map before reaching any firm decision on the basis of these facts alone. The alternate route must be able to handle the additional traffic, or the engineer has only moved the congestion over one block, and the ultimate effect will be delays on both streets as traffic learns to avoid the posted route.

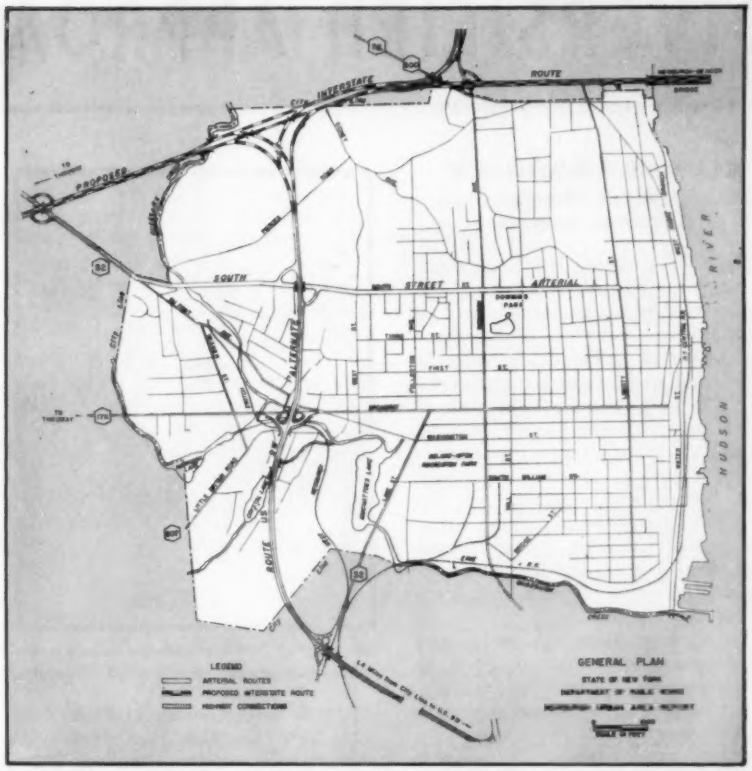
As to how much congestion is tolerable, there is no answer, any more than to the classic "How long is a piece of string?" Considered judgment, based on all the factors, rather than on externals, will influence the decision to make this type of change in the existing street pattern.

When this "painless" method of relieving traffic congestion cannot be adopted, other less painless expedients can be tried—prohibiting parking on Main Street during peak hours, or converting to one-way operation by coupling two parallel streets. These measures certainly will meet opposition from the merchants and others, but if off-street parking can be provided, much of the sting will be taken out of the curb parking ban. As to one-way streets, people just have to learn to live with them.

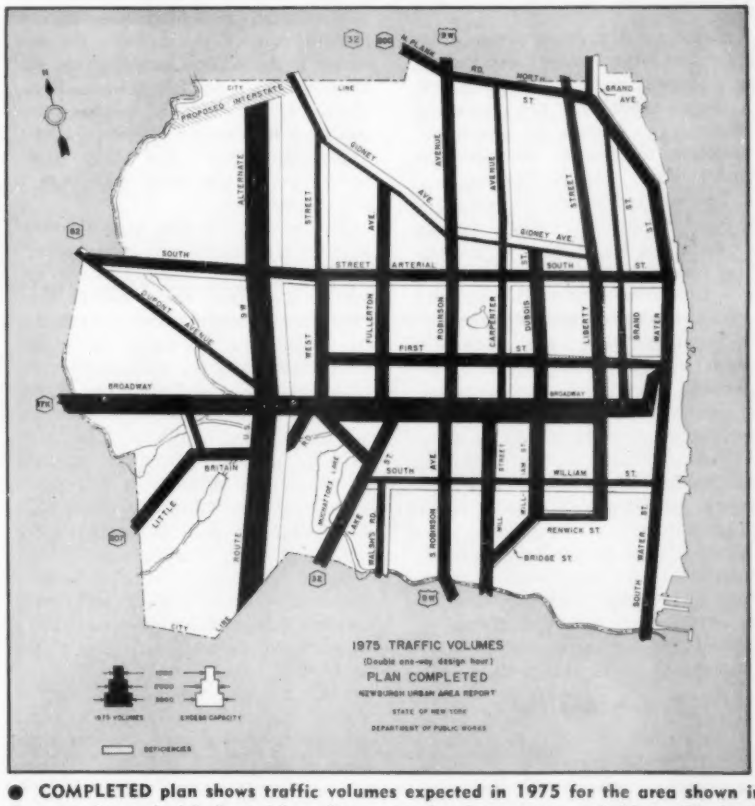
It should be anticipated that no "easy" solution to the existing Main Street bottleneck will be possible. At this point the small-town engineer has to be prepared to perform surgery. Can the street be widened sufficiently within the existing right of way to provide the necessary traffic capacity? If the answer is yes, minor surgery will do the job; but the engineer does not breathe a sigh of relief and prepare an estimate for the Common Council. Instead he turns fearfully but hopefully to his forecast charts to determine whether a present widening of Main Street will serve the traffic needs of the future.

Using this step by step analysis, the engineer will evolve a highway plan. The scope of the plan may range from a three-stage improvement program over a 20-year period which will require first a parking ban, then street widening, and finally a downtown bypass, to a simple rerouting of through traffic. Whatever the plan, it will be custom made to fit both present and

(*Continued on page* 198)



● **STREET layout and arterial and other highway connections are shown in the map of the Newburgh, N. Y. area. Such a map furnishes a starting point for further action.**



● **COMPLETED plan shows traffic volumes expected in 1975 for the area shown in the map above. Article herewith outlines steps for determining probable traffic load.**

DIVERSIFIED APPROACH SOLVES

CLIFFORD S. MANSFIELD
Fay, Spofford & Thorndike, Inc., Consulting Engineers

IT IS NOT unusual when a community finds that its available water supply is inadequate, or that its mains are incapable of distributing water at sufficient pressure to residential and industrial consumers. But Peabody, Mass., faced both of these problems—and more besides. In short, the supply and distribution systems were inadequate in not just one, but several, respects; and the city was committed to furnish water for a new shopping center, a new industrial center and an extensive residential area, all of which were under construction.

To alleviate these conditions and meet future commitments, Peabody undertook a comprehensive improvement program that was unique in the diversity of its scope. This program included:

1. Splitting a quasi-unified system into two separate water systems, namely: Peabody and West Peabody.
2. Locating a suitable water supply for the latter system and installing pumping and storage facilities.
3. Supplementing the existing water supply system by making a connection to Boston Metropolitan District Water Supply System.
4. Increasing the distribution storage capacity on the Peabody system by raising the water level in the existing reservoir and also constructing a new reservoir at the far end of the distribution system.
5. Supplementing the Peabody system pumping facilities with an automatic pump which will maintain adequate water storage in the distribution reservoirs.
6. Adding distribution mains in both the Peabody and West Peabody systems to insure adequate flows and pressures.

Most of these improvements were scheduled to be completed under a two-year program. A few, such as the installation of new mains in areas of future growth, will be programmed to keep pace with needs.

System Analysis

At the time of the investigation, the distribution system of Peabody was adequate for normal consumption demands, but in many areas the fire flow requirements established by the New England Fire Insurance Association could not be met. Also pressure in some areas during maximum hourly rates of flow were inadequate. The average daily consumption has exceeded three million gallons since 1947. In 1920, the average daily water consumption totaled nearly 4 million gallons. From then until the 1930's, consumption dropped to about 3 million gallons, and in the 1930's and early 1940's consumption averaged less than 3 million gallons.

● **NEW 1.5 MG standpipe helped overcome inadequate distribution capacity.**

The reason for the wide fluctuation in average daily consumption was found to be changes in the usage of industrial water rather than changes in population. Community population was relatively stable from 1920 through 1950, increasing only from about 19,000 to 22,600. But the water demand went from a high of over 4 million gallons in 1920 to a low of 2.4 million gallons in 1937 and then back up to a peak of 3.8 million gallons in 1953. By 1955, demand had dropped to 3.2 million gallons daily.

Study of this situation indicated that the fluctuations in industrial consumption were likely to continue, but not over such wide ranges as in the past. For planning purposes, it appeared that the future water requirements could be most accurately determined from predictions of population growth. Predictions indicated that the total population would be on the order of 33,000 persons by 1985, at which date the per capita rate of consumption might increase from its present 130 gallons daily to nearly 185 gallons daily. The city currently embraces about 9,600 acres that are suitable for building development, of which nearly 2,900 acres are in West Peabody. There are now about 3.4 persons per acre in Peabody, and this probably will increase to about 4 persons per acre by 1985. In West Peabody, the present population density is about one person per acre, and it is reasonable to anticipate that this will be doubled by 1985.

Still, this was not the entire story. Hourly rates of consumption varied greatly in different sections of the system. In Peabody, maximum hourly rates of consumption reached 250 percent of the average daily rate. In West Peabody, where rates of consumption were not affected by the heavy demands of industry, even larger fluctuations existed. It was decided that West Peabody should have a system designed for a maximum hourly rate of about 315 percent of the average daily rate.

At this point, an additional factor entered into the investigation —namely, the fire protection requirements established by the New England Fire Insurance Association. These ranged from a high figure of 5,000 gallons per minute in the downtown industrial section to 3,000 gallons per minute in less congested areas; and from 2,000 to as low as 1,000 gallons per minute in the areas of least congestion.

The water consumption rates finally arrived at are as follows: For Peabody, as average annual consumption in 1985 of 5.50 mgd and a maximum daily rate of 10.23 mgd. For 1954, comparable figures were 3.11 mgd and 5.66 mgd. For West Peabody, an average annual consumption in 1985 of 0.60 mgd. and a maximum daily rate of 1.20 mgd, compared to 0.11 mgd and 0.20 mgd in 1954.

The amount that was available was less than this total. There are two principal sources of water, Suntaug Lake and Spring Pond. Combined, these have a storage capacity of about 900 million gallons. Suntaug Lake has a total drainage area of less than one-half square mile,

COMMUNITY'S WATER PROBLEM

and Spring Pond, only slightly more. The combined safe yield of these supply reservoirs is less than one million gallons per day.

However, the city has an arrangement with the City of Lynn to secure supplementary water supply through their pumping station and intake works on the Ipswich River. This water is pumped into Suntaug Lake and increases the safe yield of the Peabody supply system to about 2.8 million gallons per day.

body. At the other end of town, just across the line in Lynn, was a 36-in. main of the Boston Metropolitan District Commission that could be connected to upon payment of a suitable entrance fee. Accordingly, it was decided to form the Peabody and West Peabody systems into two separate water districts, to provide each with its own pumping and storage facilities and to plan such improvements to the distribution systems as were necessary.

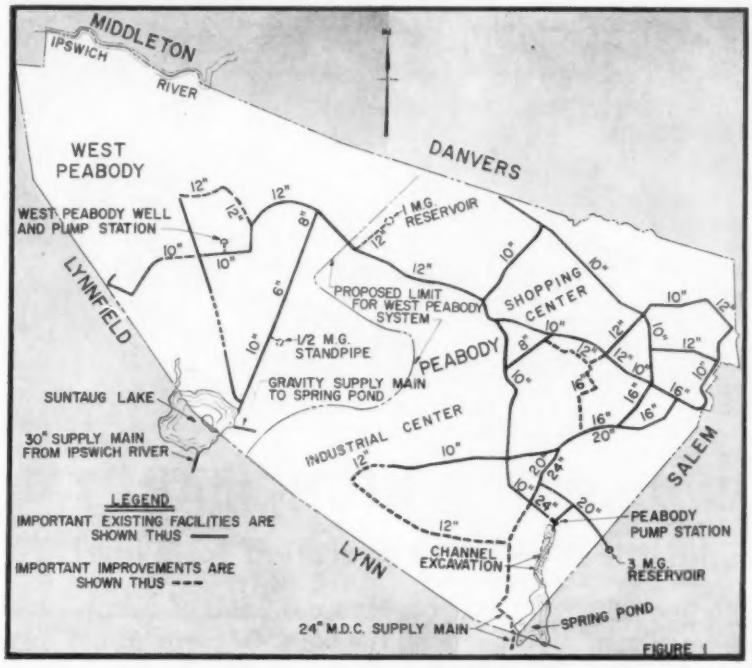


FIGURE 1

West Peabody Improvements

Extensive tests for a ground water supply were made at some 16 sites in West Peabody. A suitable location was decided on, and a permanent gravel-wall well was installed that subsequently produced a safe yield of one million gallons per day. At the same time, another site that gave promise of about one-half million gallons per day yield was set aside for further development.

Naturally, installation of a well necessitated a pumping station and suitable storage facilities. Accordingly, a deep-well electrically driven centrifugal pump was installed in the small pumping station which was constructed at the well. This pump operates against the head created by a 500,000-gallon standpipe located about one mile from the pumping station. It is controlled automatically — i.e., started and stopped by pressure switch.

Immediate improvements in the 11 miles of 6-in., 8-in., 10-in. and 12-in. distribution mains included the elimination of many dead ends by installing about 5,700 feet of 12-in. main, 4,800 feet of 10-in. main, and 800 feet of 8-in. main. At a future date it is anticipated that additional 12-in., 10-in. and 8-in.

(*Continued on page* 192)

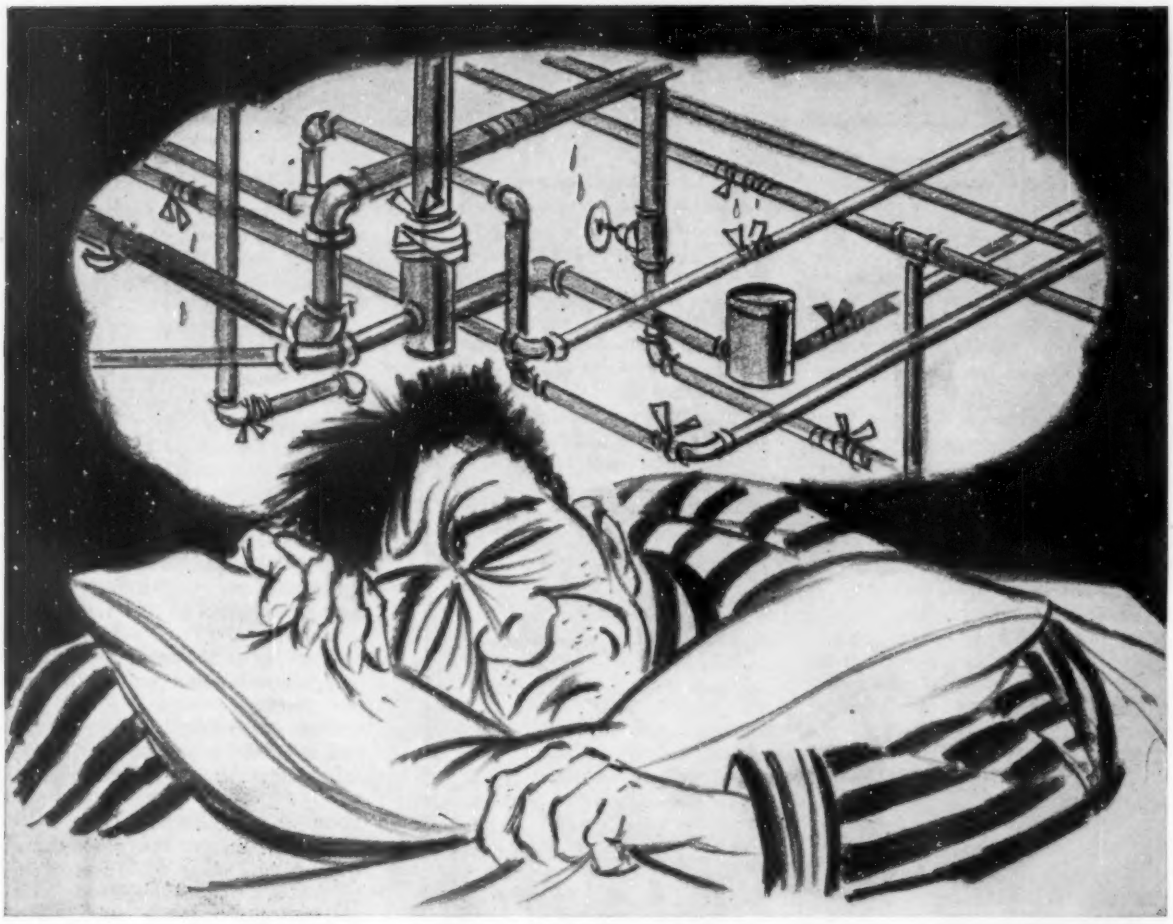
● **IMPROVEMENTS in the water system include a new pumping station, new storage tanks, additional distribution mains and a connection with the Boston District Commission supply system.**

This still is less than the average daily water consumption during 1954, and very much less than the amount which would be required by the year 1985.

Additional water supply was obtained for the West Peabody system from the Town of Danvers through a metered connection. But this supply was limited by the Danvers water pressure and the size of the West Peabody distribution pipes. Furthermore, recently Danvers requested Peabody to relinquish this source of supply because of its own future needs.

Obviously, some steps had to be taken to increase the water supply. Investigation disclosed that there was a possibility of obtaining a good ground water source in West Pea-

● **TEMPORARY channel was constructed below Spring Pond Reservoir prior to deepening supply reservoir to provide greater storage. Location is shown on map above.**



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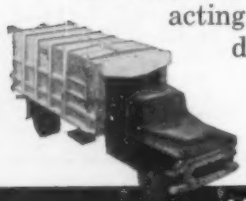

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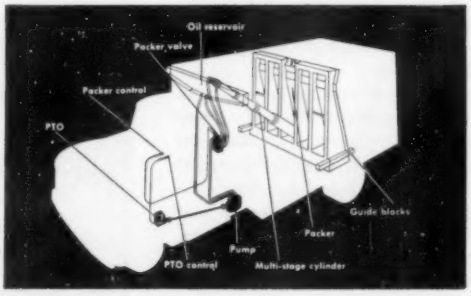

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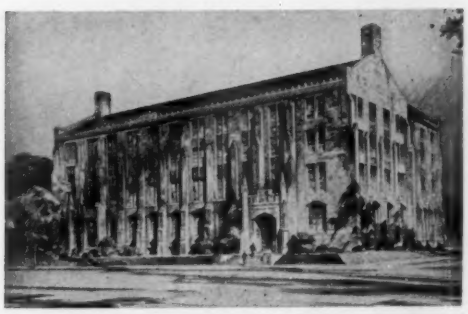
News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Henry Heald to be Guest Speaker at Association's Annual Banquet

Chicago, Ill.—Dr. Henry T. Heald, President of the Ford Foundation, will head an outstanding array of prominent speakers at the 1957 Public Works Congress and Equipment Show, which will be held in Philadelphia, Pa., September 22-25. Donald F. Herrick, Executive Director of the American Public Works Association, which sponsors this event, recently announced that Dr. Heald will be the guest speaker at the annual banquet which will highlight the four-day meeting.

David M. Smallwood, Street Commissioner of Philadelphia and General Chairman of the Local Committee estimates that 2,000 public works officials from all parts of the country will attend the 1957 Congress which will feature the largest Equipment Show ever sponsored by the Association.

Many of the nation's foremost authorities in their respective fields will participate on the program. These include the Honorable Ben West, Mayor of Nashville, Tenn., and President of the American Municipal Association; Harry Jordan, Executive Secretary, American Water Works Association; Perry Cookingham, City Manager, Kansas City, Mo.; Glenn Richards, Commissioner of Public Works, Detroit, Mich., and Chairman of the National Committee on Urban Transportation; Joseph Nicholson, Purchasing Agent, Milwaukee, Wisc., and Past President of the National Institute of Governmental Purchasing; Paul Screvane, Commissioner of Sanitation, New York, N. Y.; Don Bloodgood, Professor of Sanitary Engineering, Purdue University; George DeMent, Commissioner of Public Works, Chicago, Ill.; and Ralph Fuhrman, Secretary, Federation of Sewage and Industrial Wastes Associations—to mention just a few. The complete program will appear in the next issue.

● **INDEPENDENCE HALL, one of the landmarks of Philadelphia, site of the 1957 Public Works Congress and Equipment Show, September 22-25.**

The festivities will include a tour of historic Philadelphia, a Get-Acquainted Party, Buffet Supper, three complimentary luncheons for the men and a special program for the ladies. The City of Philadelphia and the Philadelphia Metropolitan Chapter of the APWA are going all out to make this a Congress which will long be remembered. Hotel reservation forms and further details about the Congress and Equipment Show can be obtained from the Headquarters of the American Public Works Association, 1313 E. 60th Street, Chicago 37, Illinois.

Georgia Chapter Meets in Augusta

Augusta, Ga.—The Georgia Chapter of the American Public Works Association held its annual meeting at the Bon Air Hotel in Augusta, May 30-31, with a busy two-day schedule of meetings, equipment displays, entertainment and guided tours. M. P. "Prep" Phillips, Commissioner of Public Works of Augusta, was General Chairman of the meeting which attracted 160 members and guests from all parts of the state.

Chapter President L. N. "Red" Hall, Supt. of Sanitation for Albany, president at the opening session which featured an address by the Honorable Hugh L. Hamilton, Mayor of Augusta, and talks by Sidney Carter, Planning Consultant, Augusta; Lawrence Manning, Jr., Atlantic Engineering Co.; Lew Ruff, Center Chemical Company; and W. H. Langley of the Decatur Truck and Equipment Company.

The City Council of Augusta sponsored a barbecue for the delegates and a tour of the new City-County Building which is now under construction. The Georgia Concrete Pipe Association was host at a reception preceding the annual banquet which featured an address by the Honorable Roy V. Harris of Augusta, and a message from APWA Regional Director, Al Wyler,

Director of Streets of New Orleans, Louisiana.

Others participating on the program were: Stafford Graydon, Sanitary Engineer, Atlanta; E. T. Hollifield, Div. Engineer, Atlanta Gas and Light Co.; H. M. Hewson, H. & H. Equipment Co., Charlotte, N. C.; and Tom Hopkins, Pak-Mor Manufacturing Co., San Antonio, Texas. The exhibitors sponsored the closing luncheon which was followed by a tour of the Clark Hill Dam and Power Plant.

Grady Young, Sanitary Inspector for Atlanta, was elected president of the chapter to succeed L. N. Hall, who will remain on the Executive Committee in an ex-officio capacity. R. N. Allred, Supt. of Motor Transport, Columbus, was elected Vice President, and John Ball, Assistant Sanitary Engineer, Atlanta, was re-elected Secretary-Treasurer. Others elected to the Executive Committee are: M. P. Phillips, Commissioner of Public Works, Augusta; Riley Milam, City Manager, Gainesville; E. E. Watkins, City Manager, Carterville; and E. F. Ledford, City Engineer, Valdosta.

Indiana Members Take Steps to Organize 29th Chapter of APWA

Fort Wayne, Ind.—J. B. Swanson, Chairman of the Board of Public Works of Fort Wayne, Ind., and District Representative of the American Public Works Association, recently announced that 40 members have signed petitions calling for the organization of an Indiana Chapter of the APWA. Preliminary steps to form this chapter were taken at an informal luncheon meeting held at the Purdue Union Building in West Lafayette, last April.

The petitions and proposed By-laws to govern this chapter will be submitted to the Board of Directors as its next meeting. The establishment of this chapter will bring the total numbers of APWA Chapters to twenty-nine. Mr. Swanson indicated that he is hopeful that the Inaugural meeting will be held in Fort Wayne during the early part of November.

Fringe Area Problems Discussed at Kentucky Chapter Meeting

Lexington, Ky.—The Second Annual meeting of the Kentucky Chapter of the APWA was held at the Campbell House in Lexington on Wednesday, June 12. Herbert Fritz, City Manager of the Host City, presided at the morning session which included greetings from Mayor Shelby Kinkead and a talk

on "The Urban Fringe Problem" by Roy Owsley, Management Consultant to the Mayor of Louisville. Carl Wachs, Executive Director of the Kentucky Municipal League; Oscar Hesch, City Manager, Covington, and Walter Shouse, Director of the Planning and Zoning Division for the State Department of Economic Development also participated in the discussion of this topic.

The Owensboro Clay Pipe Company sponsored a reception which preceded the noon luncheon. APWA President Robert L. Anderson, Superintendent of Public Works, Winnetka, Illinois, was guest speaker at the luncheon meeting which also featured the election of a new slate of officers.

The top post went to R. S. Weikle, Supt. of Sanitation of Owensboro. Russell Marshall, City Engineer of Frankfort, was named Vice-President and Newton W. Neel, City Engineer of Henderson, was elected Secretary-Treasurer. Tom Robinson, Consulting Engineer, Lexington, and John Leake, Director, Department of Sanitation, Louisville, were elected to serve two-year terms on the Executive Committee. Wallace Sanders, City Engineer, Louisville, and W. D. Anderson, General Manager, Sanitation District #1, of Covington, are also on the committee and are serving the second year of their two-year term of office.

City Manager John A. Hettler, of Owensboro, presided at the afternoon session which included three talks and an inspection trip which was arranged by George W. Gard, Director of Public Works of Lexington. The first speaker was Arthur Lahrman, Supervisor of Insepction and Programming for the Highway Maintenance Division of Cincinnati's Department of Public Works, who discussed the subject of "Street Cleaning and Maintenance". This was followed by a talk on "Refuse Collection and Disposal" by John Leake and another on "Sanitary and Storm Sewers" by R. Watkins, Consulting Engineer of Lexington.

Northern California Chapter Elects New Slate of Officers

Oakland, Calif.—The June Meeting of the Northern California Chapter of the APWA featured the election of a new slate of officers. Olof E. Anderson, Road Commissioner and Surveyor of Alameda County, took over the President's gavel from John L. Kergel, Senior Highway Engineer of the State Division of Highways. K. G. Heine, Supt., Construction and Engineering Div., Pacific Telephone and Telegraph

Co., of Oakland, moved up from Secretary-Treasurer to Vice President, and Marvin Anaya, City Engineer of El Cerrito, was elected Secretary-Treasurer. The meeting featured an interesting discussion on "Old Automobiles and New Driveways" by Jordan Carlton and Marvin Anaya.

Palm Elected President of New Orleans Chapter

New Orleans, La.—The June Meeting of the New Orleans Chapter of the American Public Works Association was held at the Engineers' Club in New Orleans, with a total of 68 members and guests present. Clarence H. Palm, Senior Gas Engineer, New Orleans Public Service, Inc., was elected President of the Chapter to succeed S. di Benedetto, Civil Engineer of the Sewerage and Water Board. George Stevens, District Engineer, Louisiana State Highway Department, was named Vice-President, while the Secretary-Treasurer's post went to Stuart H. Brehm, Jr., of the City's Planning Commission staff. Paul L. Ristroph, Director of New Orlean's Utilities Department, and Owen V. LeBlanc, Civil Engineer for W. Horace Williams Company, Inc., were elected to serve on the Executive Committee.

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A Modern Municipal SWIMMING POOL

From an article by R. W. Armstrong, Supt. of Parks, Aurora, Colo., in Colorado Municipalities.

AT A COST of about $185,000, Aurora, Colo., has constructed a modern municipal swimming pool. Actually, the Aurora pool consists of three separate pools; the main swimming pool, the diving pool and a combination wading and junior pool. The main pool is 60 ft. wide by 165 ft. (50 meters) long, with a water depth of 3 ft. at the shallow end, increasing uniformly to 4½ ft. at a point approximately three-quarters of the length of the pool. The remaining quarter of the main pool is a deep swimming area with an average depth of 7 ft.

The diving pool is 45 ft. square with a minimum depth of 10 ft. under the diving boards. There are two 1 meter and one 3 meter boards. The combination wading and junior pool is for the use of children too small to be allowed in the shallow end of the main swimming pool. A low fence divides the two to prevent the accidental entry of small children into the deeper water of the junior pool. The wading pool is 15 x 20 ft. in area with a depth of 9 to 12 inches; the junior pool is 20 x 25 ft. in area with a depth of 18 to 21 inches. Both sections of this pool are within a separately fenced area accessible only from the rear deck of the bathhouse, safely isolating this non-swimmer group from either the swimming or diving pool area.

Wide concrete promenade decks surround the pools and provide a total deck area equivalent to 120 percent of the total water area. The pool decks are enclosed by a 6-ft. steel fence. Outside the pool area a 5-ft. wide concrete walk is provided for spectators, and a number of benches are spaced around this walk for their use.

Safety and usability were prime considerations in the design and layout of this pool. Another major factor was the conservation of water. By isolating very small children in the wading and junior pool and by separating all diving facili-

2 BLAW-KNOX BITUMINOUS PAVERS
do work of three ordinary pavers

16-Foot Paving Width—High Travel Speed Make Massachusetts Paving Go Faster

A wide 16-foot paving width combined with the mobility for making fast restarts allowed Massachusetts Turnpike Contractors to use two Blaw-Knox Model PF-90 Bituminous Paver Finishers where three of any other make would be required.

One of the Blaw-Knox Model PF-90 Bituminous Paver Finishers was set to pave a 16-foot paving width including a 4-foot shoulder with a 4% grade. A second Model PF-90 followed at a 150-foot interval paving a 12-foot strip. Every 500 to 600 feet one of the pavers was quickly re-rigged and returned to lay the final 10-foot paving strip to assure a hot joint between all three strips.

The combined advantages of larger hopper, wheel mounting and a wide paving width make the PF-90 the finest bituminous paver for all big production jobs. These features added to the high travel speed make the Blaw-Knox Model PF-90 the leader in its field.

For complete information on the Blaw-Knox Model PF-90 Bituminous Paver Finisher see your local Blaw-Knox Distributor or write Blaw-Knox Company for Bulletin 2475.

Model PF-45
Ideal for Small Paving Jobs

If you have smaller black top paving jobs the Blaw-Knox Model PF-45 Black Top Paver gives you the same economy advantages of rubber-tired mounting which you get with the PF-90.

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Construction Equipment Division
43 Charleston Ave., Mattoon, Illinois

ties, both safety and usability are improved.

Water recirculates in all three pools, with the use of the same filter plant and recirculation pump. The hydraulic design of the filter plant and recirculation system provides a one-hour turnover in the wading and junior pool, a six-hour turnover in the main swimming pool and a nine-hour turnover in the diving pool. These various recirculation ratios are proportioned to the sanitary load on the pools.

The filter plant is located in a semibasement structure directly adjoining the diving pool, using one wall of the diving pool and a part of the diving pool deck as combination construction for both the filter plant and diving pool. Anthrafilt was chosen as the filter media. By the use of the "Top-Water" recirculation principle, which returns the entire gutter overflow from all of the pools back to the filters, the pools can be kept continuously full. This reduces the water consumption of the pool. Recirculation also provides improved sanitation as the continuous skimming of the top surface of the water to the gutters removes floating material in the pool and reduces the chlorine demand.

Because of the dry climate, with a resulting high rate of evaporation, facilities for heating the water in all the pools were included in the plans and specifications. Heating is necessary also because of the cool nights and the relatively low temperature of the water supply.

The Aurora Municipal Pool is situated in the largest park area in the city. This 47-acre area is connected by a very good parkway system which provides efficient traffic circulation to the pool and park. Sufficient parking space has been provided for the largest crowds anticipated.

• • •

Snow Removal Operations

Snow removal and ice control on county roads is performed by the towns under a contract with the county in Montgomery County, New York. Each town plows and sands the county roads within the town for $150 per mile. This information is from the 1956 Annual Report of Montgomery County, New York, by Harry R. Mason, County Highway Superintendent.

• • •

Chemical Weed Control in Wayne County, Michigan

Various concentrations of 2,4D with a spreader-sticker additive to increase the wetting power were used in the weed-control program on roads, grade separations and parks in 1956, in Wayne County, Michigan. One spraying application of the weed-killer solution was made on the grass areas of all county maintained grade separations and expressways and on the roadsides of nearly all county primary roads and state trunklines. Dry weather, which reduces the effectiveness of the spray, caused a cessation of weed-spraying operations before the southern part of the county was completed. Approximately 1,000 miles of roads in the county, an area of 5,600 acres, were treated in 1956 requiring 2,880 gallons of 2,4D and 496 gallons of 2, 4, 5T. The average cost per acre was about $7.70. In the county parks, approximately 340 acres of grass areas were sprayed with 198 gallons of 2,4D at a cost of $5.00 per acre.

Soil sterilizers were used on the median strips of the Ford Expressway and on the Lodge Expressway to kill undesirable weed growths. It was found that desirable grasses could not survive salt splash. Soil sterilants were also applied to expansion joints and cracks on the decks of various bridges and grade separations to prevent vegetable growth.

Polselli & Angelucci use Heltzel Flexible Radius Forms in pouring a sharp curve in the driveway section of Abington School in a Philadelphia suburb.

For more gentle radius curbs, Heltzel Straight Curb Forms were used. Abington School required approximately two miles of curbing.

"For my money, I'll take HELTZEL FORMS ...everytime!"

SAYS LEADING PHILADELPHIA CONTRACTOR

"I've used them all, and I'll say Heltzel builds the best line of forms I know of," says George Angelucci, partner of Polselli & Angelucci, one of Philadelphia's best known curbing contractors.

"My form setting crew can set a third again as many Heltzel Forms as other makes," continues Mr. Angelucci. "What's more, Heltzel engineers know the industry, and design their forms to the contractor's advantage. There's no form bowing because the stake pockets are placed in just the right spots to give the form maximum strength and rigidity."

If you haven't as yet tried Heltzel Forms, why not take the advice of leading contractors—like Polselli & Angelucci—and use the one outstanding form available today. Heltzel builds a complete line of steel forms for any concrete job — straight curb, radius curb, curb and gutter of any description, sidewalk, driveways, foundations, piling, island, etc. Next time — specify "Forms by Heltzel" — for almost half a century America's leading form manufacturer.

THE HELTZEL STEEL FORM AND IRON COMPANY

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George Angelucci checks form alignment as pouring goes on behind him.

KANSAS TURNPIKE
SEWAGE TREATMENT PLANTS

CLIFFORD SHARP

Haskins, Riddle & Sharp
Consulting Engineers
Kansas City, Mo.

This article is based on a paper by Mr. Sharp before the Kansas Sanitary Engineering Conference which was held at Lawrence early this year. Publication is by courtesy of the Conference through Dwight Metzler, Director of the Division of Sanitation of the Kansas State Board of Health.

A TURNPIKE HAS SOME features which cause it to vary quite widely from a normal highway project. One of these is the provision of service areas. These service areas provide eating and automobile service facilities for use by the turnpike patrons. With such facilities there naturally are involved the provision of such utilities as water, light, and sewage collection and disposal.

Although some turnpikes have been in operation for several years, the factual data that are available on such an item as sewage flow, strength and composition, leave much to be desired. This we quickly found out when we were employed to design the water supply and sanitary sewerage facilities for service areas on the Kentucky and Kansas Turnpikes.

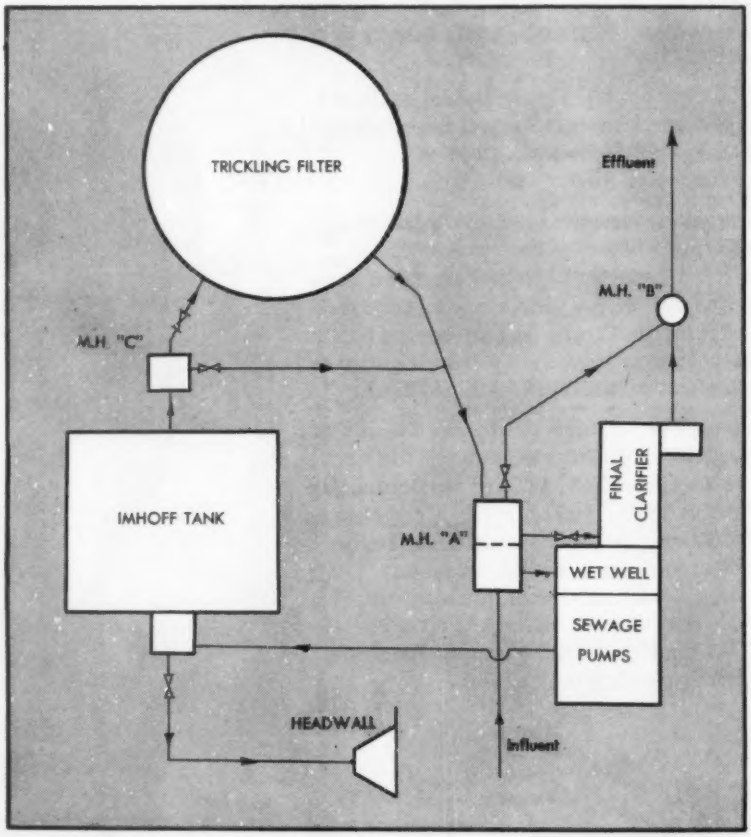
The late Charles A. Haskins, the senior member of our firm, began a search for data that would provide a reliable basis for design. He found that practically all of the data available had been secured by manufacturers producing sewage treatment equipment, in particular Yeomans Brothers, Dorr-Oliver Inc., and Chicago Pump Company. This information was obtained and studied, and in addition Mr. Haskins personally inspected a number of installations on the Pennsylvania and New Jersey Turnpikes, observing the types of facilities provided, their condition and treatment efficiencies, and also personally collecting some additional data. Further, he found another source of some additional information in the Howard Johnson chain of restaurants.

The data thus obtained were compiled, studied and the following conclusions reached: Ten percent of the cars passing a given service area will be customers of that service area. On the average, there will be three people per car. Data from the Valley Forge, Pennsylvania, service area indicated a minimum water use of 15 gallons per restaurant customer with an average restaurant check of $0.72 per customer. On some holiday weekends the use increased to 20 gallons per customer and an average check was $0.87.

Restaurant operators suggested a design basis of 350 gallons per day per counter seat and 150 gallons per day per table seat. These values, applied to the Valley Forge installation, gave daily flows agreeing quite closely with, but slightly higher than, the observed maximum water usage. The water use per customer is higher in warm months than in cool months. The peak month traffic-wise can be expected to be 150 percent of the annual average, but the peak month for food sales will be about 162 percent of the annual average. The water consumption follows food sales very closely.

The sewage flow from a turnpike service area will fluctuate rapidly and widely, generally hitting a maximum peak of approximately 200 percent of the average daily rate during the noon hour and a secondary peak of about 160 percent of the average around 6 pm. However, in addition to the daily variations there are seasonal variations and some unexplainable, nonseasonal variations at different service areas.

The sewage from service areas consists predominately of restaurant wastes; the rest room wastes



● **TYPICAL layout of sewage treatment plants designed for the Kansas Turnpike.**

ADD NEW FORMULA BANOX® TO SALT . . .

Stop Salt-Slush Corrosion

Snow and ice control on city streets is best maintained by low-cost* salt. But salt-slush is very corrosive, and that's where BANOX comes in.

As little as one pound of BANOX added to every 100 pounds of salt protects metal surfaces—cars, bridges and municipal equipment—against salt-slush corrosion. And BANOX costs little, a few cents per capita per year, but it saves a lot. BANOX in salt will not damage concrete, blacktop or brick pavements.

Your community deserves the low-cost protection that the salt-BANOX team can give. And remember, when spring comes, there is no costly clean-up of sewers, gutters and catch basins when you use salt.

BANOX is inexpensive to use, too; it needs no special mixing, is evenly distributed by normal traffic. New formula BANOX, available now, gives *improved* protection against salt-slush corrosion. Write for free booklet.

*Comparative cost figures for both city streets and highways indicate that you can save as much as $4.27 per mile by using rock salt instead of abrasives.

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are less in quantity and strength, low in solids content and high in soap and urine. The sewage can be expected to have approximately the following composition: BOD—600 ppm; suspended solids—300 to 450 ppm, of which about 90 percent is volatile matter; pH—9.5; grease—100 ppm; active detergents—100 ppm; and temperature—70 to 85° F, with a maximum of 130°F.

Factors in Design

The sewage treatment facilities should be simple to operate and maintain, should be capable of handling wide variations in hydraulic loading and should be rugged enough to handle extreme changes in organic loading. The simplicity of operation and maintenance cannot be over-emphasized since the Turnpike Authorities commonly use a crew of one or two men to operate the water and sewage facilities for two or more service areas.

A conference was held with the Kansas State Board of Health at Lawrence. As a result of this conference we were advised that the following criteria would govern sewage treatment facilities for the service areas on the Kansas Turnpike: (a) A recirculation rate of not less than 1 to 1 must be provided, and settling facilities sized accordingly; (b) Imhoff tanks were acceptable provided the overflow rate did not exceed 1000 gal/sq.ft. /day and sludge digestion capacity was not less than 6 cu.ft./capita; (c) trickling filters could be loaded up to 650 lbs. of 5-day BOD/acre foot; (d) final clarifiers must have an overflow rate of not to exceed 1000/gal/sq.ft./day, based on maximum rate of raw sewage flow. Also, continuous removal of sludge should be provided: (e) sand filters should have sand with an effective size of between 0.5 and 0.75 mm. Open filters could be loaded up to 80,000 gal/acre/day and covered filters up to 10,000 gal/acre/day.

With the above data and review criteria in mind the design was established as follows: (1) Since nearly all the available data related to water usage, it was decided to design the sewage treatment facilities on the basis of receiving a raw sewage flow equal to the water usage. Thus, any water used for car washing, lawn sprinkling or other similar non-contributing purposes would provide that much additional safety factor. (2) No waste water from car washing and greasing operations would be discharged to the sanitary sewer sys-

tem. (3) The sewage treatment plants would consist of a comminutor; Imhoff tank; standard type trickling filter; final clarifier with mechanical sludge removal; recirculation facilities; and provisions to permit loading of wet sludge for disposal in the liquid state. This type of plant was selected because it could be so arranged as to be compact in layout, and was of dependable performance and simple to operate and maintain. Further, since none of the plants would discharge into a receiving stream of appreciable proportions it was necessary for the plant to produce continuously a high quality, well stabilized effluent.

In order that land acquisition could be held to a minimum, the plants were designed to be constructed within the service area, between the separated turnpike lanes, and as far removed from the restaurant facilities as feasible. The waste lines from those kitchen operations that could normally be expected to contribute grease would be discharged into a three-compartment 500-gallon capacity grease trap of concrete construction and having ready access for grease skimming.

Study of the expected traffic flow and consequent patronage indicated that the three major service areas (Lawrence, Emporia and El Dorado) could be made identical, each to receive a raw sewage flow of 40,000 gallons/day from an equivalent population of 1,200 persons.

Detail Design

The flow pattern provides that: Raw sewage flows to the plant by gravity and passes through a comminutor into an open wet well located immediately beneath. Vertical centrifugal sewage pumps in an adjacent dry pit lift the sewage to the Imhoff tank at a constant rate continuously. The Imhoff tank effluent flows by gravity to the rotary distributor on the trickling filter, and the filter effluent flows by gravity to the final clarifier. Final clarifier effluent flows through a sump and on to the receiving drainage course. A flow, sufficient to make up the difference between the pump capacity and the raw sewage flow, is automatically returned by hydrostatic head from the sludge hopper of the final clarifier to the wet well. The trickling filter may be by-passed, the final clarifier can be by-passed or the entire plant may be by-passed. In the event of a power failure, raw sewage automatically over-flows a weir and passes through the final clarifier prior to entering the receiving drainage course. Water for scrub-down and lawn sprinkling purposes is obtained by means of a pump located in the sump situated in the effluent line from the final clarifier. A loading platform, equipped with a hose connection, is provided for the loading of liquid sludge, by hydrostatic head directly, from the Imhoff tank into a sludge hauling tank. The loading platform drains by gravity into the plant influent.

One feature, not often used, was incorporated into the plant design at the suggestion of the State Board of Health. This feature consists of a time clock controlled blower to introduce air below the liquid level in the gas vents of the Imhoff tank for the purpose of keeping the scum broken up.

The treatment plants for the three minor service areas (Topeka, Matfield Green and Wellington) are also identical, each is designed to receive a raw sewage flow of 25,000 gallons/day from an equivalent population of 750 persons. The layout and flow pattern of these plants is the same as for the major service areas.

Specific design factors were as follows: Raw sewage flow 40,000

gpd for the major areas and 25,000 gpd for the minor areas, resulting in a plant design flow of 115,200 and 79,200 gpd respectively, equal to 96 and 106 gpcd. Recirculation factor is 2.04 at the major areas and 2.14 at the minor areas. Imhoff tank overflow rates are 400 gpd/sf at major and 500 gpd/sf at minor areas. Detention time in both cases is 2 hrs. Weir loadings are 9,583 and 9,900 gpd/ft. Sludge capacity in both major and minor area plants is 6 cu.ft. per capita. Blower capacity is 10 cfm at 5 psi in both plants, providing 0.46 and 0.5 cfm per sq. ft. of surface respectively.

Organic loading on the filters, on the basis of 30 percent removal in the Imhoff tanks is 444 lbs. per acre foot per day at the major plants and 435 lbs. at the minor plants. The hydraulic loadings are 2.56 mgad and 2.73 mgad. Filter walls are carried 2 ft. above the stone and vitrified clay underdrains are provided.

Final clarifiers, on the basis of design flow, have overflow rates of 1,067 and 990 gpd/sf respectively; but the rates on the basis of raw sewage flow are 371 and 312.5 gpd/sf. Detention periods at design flow are 0.75 hr. for the major areas and 1.09 hr. for the minor, but based on raw sewage flow rates, these are 2.73 and 3.45 hrs.

The calculated plant effluent BOD at maximum loading is 35 to 46 ppm; but the expected effluent content is about 20 ppm BOD.

The costs for the individual plants naturally varied somewhat due to individual plant factors. The major area plants averaged $57 per capita and the minor plants averaged $82.-60 per capita. These are a little high due to the fact that the power cable from the restaurant building to the treatment plant was included in the lump sum price bid for the plant.

Attention is again called to the desirability of securing factual data from operating turnpike facilities. Such data should include the traffic count, food sales, sewage flow and composition. Also, the importance of competent operating personnel cannot be over emphasized.

• • •

Hub Marking Program Reduces Thievery

A campaign to engrave identification numbers on hub caps as a means of preventing their theft is gaining momentum in many parts of the country. Chicago is the latest big city to join the movement. Until now, the main difficulty in combating the hub cap thief has been the lack of any kind of identifying mark on the hub cap itself. Receivers of stolen goods could buy and sell them with carefree abandon, and offered a ready market for busy thieves.

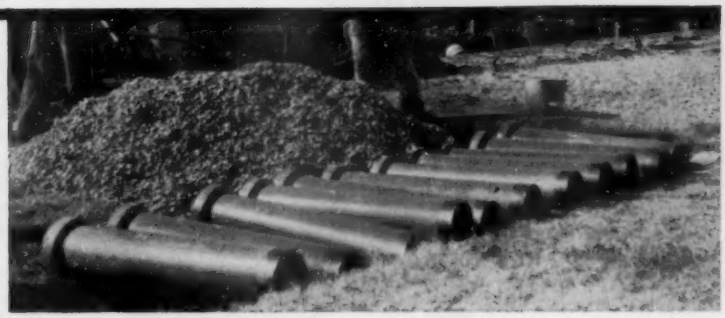
A plan for stopping the hub cap thieves by a system of permanent identification has been tested and proven highly successful. In test cities where the plan was put into operation, hub cap thefts were quickly reduced by as much as 80 percent. Police departments and insurance companies strongly endorse the method.

Using a small electric tool called a Vibro-Graver, the owner's license plate number or other identifying mark is permanently engraved on each hub cap in the valve stem area. In states where new license plate numbers are issued each year, other systems may be used. Examples: The license number and the year, or the motor number. The fact that the hub caps bear a permanent identifying mark of any kind is enough to discourage thieves. Receivers of stolen goods are aware of the hazards involved, and will not buy marked hub caps.

CITY OFFICIALS: Leonard J. Toups, Mayor;
Kenneth Hoffman, Commissioner of Finance;
Bertrand Hebert, Commissioner of Public Property
CONSULTING ENGINEERS: J. B. McCrary Engineering Corporation
CONTRACTOR: Hebert Brothers Engineers

Expert Engineering and Installation of Long Lengths . . .

CLAY PIPE Overcomes Tough 26-Mile Sewer Job



Thibodaux, Louisiana faced "extremely difficult soil conditions" in its recent big sewer program . . . an investment in public health that will be paying dividends far into the future. To provide the most modern sewerage facilities, more than 138,000 feet of Vitrified Clay Pipe was specified and carefully engineered for the $1,437,000 sewerage system.

Vitrified Clay Pipe used in the Thibodaux project is the new longer, stronger, denser development of the pipe long famous for never corroding . . . never disintegrating . . . never rusting . . . no matter how long it is underground.

But when it came to laying the lines, "Bayou Country" unstable soil and seeping water put up a fierce battle against modern sanitation. Thanks to expert engineering and careful laying practices (note the narrow straight trenching, good bedding, careful bracing, true alignment) and today's modern extra-long Clay Pipe, Thibodaux can depend on its sanitary system long after the last bond has been retired.

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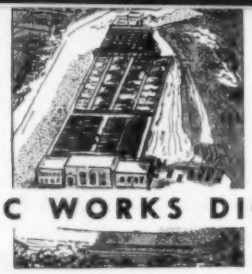


PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Three Florida Incinerators

The best incinerators have to be tailor-made. If a city is going to get its dollar's worth in incinerator value, it has to cut and fit its needs to its particular set of conditions. The three incinerators at Ft. Lauderdale, Miami, and Coral Gables, all fairly close together, in the same climatic zone, serving generally similar populations, show how these differences work. Each was faced with the common problem of disposing of increased garbage and refuse without creating a nuisance or health hazard. None of these three cities had money to waste. The Miami plant is probably the most interesting having been described by some as essentially a power plant using refuse for fuel, thereby cutting its general costs; it also takes pains to clean its stack gases to avoid odor or fly ash nuisances. Fort Lauderdale built an incinerator to spare, lean design, taking advantage of its fairly remote location. It also did not have to provide thorough fly ash removal for this same reason. Coral Gables, because of the plant location, took special precautions to assure a clean stack gas. This plant also was designed to take tree trimmings and other lawn and street refuse.

"Three Florida Incinerators." By Warren H. Sleeger. *The American City*, June, 1957.

Total Oxidation Treatment

This article sets forth some thought-provoking ideas of a mechanism for the biological oxidation of sewage and other wastes amenable to bio-oxidation. The first premise is predicated upon the acceptance of the biochemical oxygen demand as being the oxygen used in the aerobic decomposition of pollution. Then a bio-oxidation system must be designed for the magnitude of the BOD value, complete treatment being based upon the ultimate or 20-day BOD as the design parameter. The second premise is that solids removal is unnecessary before oxidation. The organic pollution entering the oxidation tank is enzymatically metabolized by the biota of the activated sludge. The aeration tank must have a 6-hr. displacement capacity in order to complete the metabolic process; the oxygen supply per day must equal the 20-day BOD weight per day; and the clarifier must be designed adequately for the maximum waste flow rate. A number of treatment plants have been built and are operating embodying these principles.

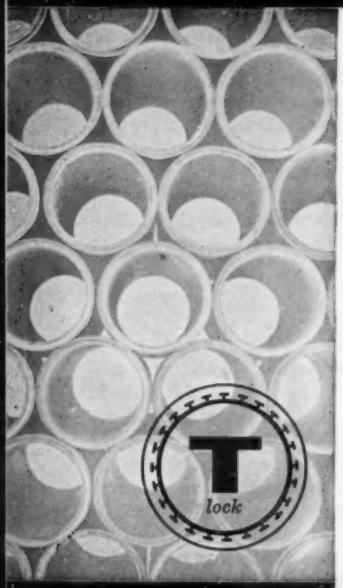
"For Sewage Consider Total Oxidation Treatment." By R. Rupert Kountz. *Water and Sewage Works*, June, 1957.

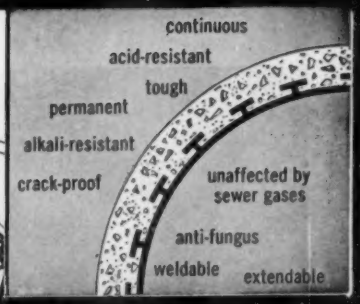
Syndets and Waste Disposal

One of the most intriguing and challenging problems to face sanitary engineers is that of the disposal of synthetic detergents, better known as syndets. No topic of conversation among sanitary engineers is more controversial than the effect of syndets upon water treatment systems and upon sewage treatment systems. This paper does not attempt to exonerate or to condemn syndets, but rather attempts to set forth all of the facts that are available so that each person may draw his own conclusions. Some of the problems indicated in sewage treatment plant operation have been frothing in aeration tanks and outfall lines, reduced efficiency of primary sedimentation devices, reduced efficiency of secondary treatment units, and lower gas yields in digesters. The water treatment problems have included poor flocculation and sedimentation, tastes and odors, reduced filter runs, and frothing of the finished water. There appears to be two schools of thought on the solution of the syndet problem. One solution appears to be to change the chemical structure of the syndet so that it can be biologically degraded; the other appears to be to change the treatment

Award Winning Trickling Filter Plant

Built in 1952, this trickling filter plant in Panama City, Fla., won honors in 1954, 1955 and 1956 from the Florida State Board of Health as "the best operated trickling filter plant in the State." Biofilter is designed for 3 mgd and the plant produces an effluent with about 11 ppm BOD. Due to the flat terrain, there are 30 or more sewage lift stations, 22 of which are equipped with a total of 51 Fairbanks-Morse pumps. The plant serves about 82,000 and is designed for expansion to 4.5 mgd. Photo and data are courtesy Morrison-Gottlieb.





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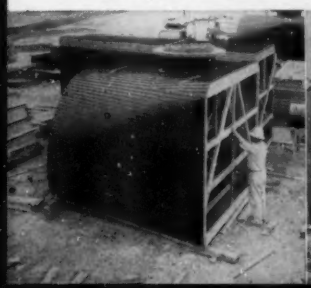


T-Lock in place on inner form before pipe is poured.

design to compensate for the action of syndets. It will be some time before a change will be made in syndet structure and therefore the engineer must solve the problems of design and operation at hand today.

"Syndets and Waste Disposal." By Ross E. McKinney. *Sewage and Industrial Wastes*, June, 1957.

Philadelphia's Newest Facilities

Since December 20, 1956, the volume of flow in the Schuylkill River has been reduced by approximately 45 mgd, a reduction of considerable benefit to the City of Philadelphia. On that day sewage flowing into the river from intercepting sewers along the east bank was diverted to a new complex network of interceptors, a siphon under the Schuylkill River and a large pumping station; then to the Southwest Sewage Treatment Works, and finally into the Delaware River for disposal. The interceptor, siphon, and pumping station make up the latest link in the city's 40-year $80 million sewage collection and treatment program.

"More Sewage for the Plant—Less for the River." By Samuel S. Baxter. *The American City*, June, 1957.

Sewage Effluent Reclamation

An increasing awareness of the future water needs and the difficulties in meeting these requirements from the available sources in specific areas has produced a healthy interest in the possibility of reclaiming sewage effluents. In a broad sense "sewage reclamation" has been defined by the author as the purposeful upgrading of the quality of sewage with the intent of making it re-usable by agriculture, industry, or the public. If sewage is to be seriously considered as a source of reclaimable water it is important to know how much water is involved, and what is its availability to potential users. Using these as some of our guiding criteria it is shown that the production of water for general irrigation purposes can hardly be the principal goal of water reclamation. For other potential uses the story is more favorable. Specifically, this includes industrial uses, local irrigation needs, and increasing the domestic supplies by ground water recharge. Comparative costs of new and reclaimed water at a few places in the Southwest for a variety of uses are presented in the article. The article also includes a discussion of the present knowledge about sewage reclamation, its present status, and the prospects for its future development.

"The Why and How of Sewage Effluent Reclamation." By P. H. McGauhey. *Water and Sewage Works*, June, 1957.

Refuse—A Resource

In Cedar Rapids, Iowa, city officials have made conscious efforts in developing their sanitary landfill towards a definite useful purpose. They have considered their municipal refuse as a low-cost resource that was put to profitable use by utilizing it to construct an addition to a park in an expanding residential community. They purchased 94 acres at a cost of $20,000, of which about 40 to 50 acres will be used under the present plan. The first order of business was removal of the trees and brush prior to beginning the landfill operations about a year ago. It is estimated that from 5 to 8 years of fill can be handled on this site from the entire city with a present population of 85,000 people. Everything—garbage and rubbish—is dumped in together and compacted daily after being covered with about two feet of soil. There has been an absence of rats or complaints from odors, papers, or other nuisances. Salvage operations are leased to a salvage operator at $150 per month. The cost of running the landfill operations for 1955, excluding capital investment, but including salaries, tractor parts, etc., was about 11¢ per capita. At the conclusion of the landfill operations the land will revert to the City's Park Department at no cost.

"Municipal Refuse—A Low-Cost Resource." By Carl D. Smith. PUBLIC WORKS, July, 1957.

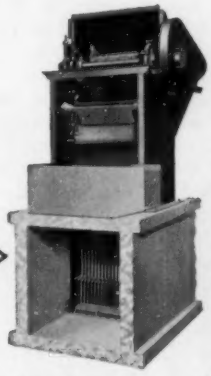
Detergents: Experiments—Operating Experiences

This is an abbreviated report of the discussion of the original paper presented by William T. Lockett at the 1956 Annual Conference on Sewage Purification at Harrogate, England. The four discussants related their experiments and operating experiences with regard to synthetic detergents in relation to the purification of sewage. Production of foam was the most obvious effect of detergents on sewage works, but there were other effects no less serious. One of these was that the alkylarylsulphonate had a slowing down effect on the processes of

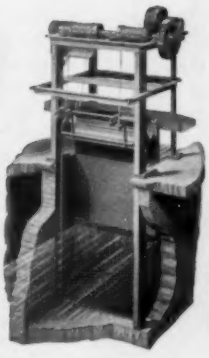
treatment of sewage. The actual made to claims originally made in "Two Procedures for Grit Chamber

Get waste treatment off to a safe start...with LINK-BELT screens

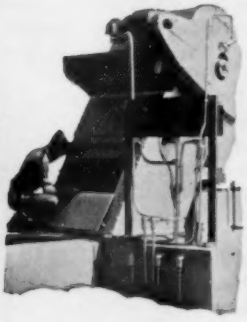
...for removal of large solids



THRU-CLEAN SCREENS. Automatic, chain-operated rakes clean from downstream side, are designed to eliminate jamming by debris. Vertical mounting minimizes friction between rakes and bars.



STRAIGHTLINE SCREENS. Automatic, cable-operated rake cleans from upstream side, assures clean, positive screenings removal. Easily accessible—no moving parts are mounted under water.



TRITOR SCREENS. Combined screen and grit chamber saves smaller plants the cost of separate units to remove large solids and detritus. Shredder for screenings can be provided, if desired.

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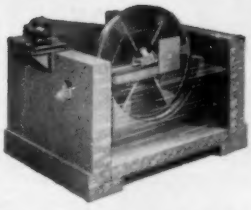
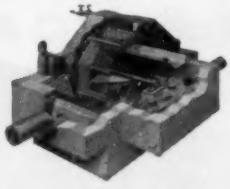


LIQUID VIBRATING SCREENS. For thorough removal of fine solids from industrial liquids. High-energy vibration provides a relatively dry product with minimum blinding or clogging.



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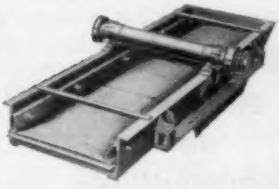

WHERE coarse or fine solids threaten to clog or damage subsequent equipment . . . where stream pollution must be prevented or valuable by-products can be recovered — efficient waste treatment begins with a Link-Belt screen. This broad line is your assurance of an impartial recommendation based on the specific nature of your waste. For full data, contact your nearest Link-Belt office or write for Book 2587.

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treatment of sewage. The actual magnitude and the concentration at which an effect was noticeable was not in agreement among different workers. Two possible theories had been advanced by the author in respect to the interference of alkylarylsulphonates with the biological processes of sewage treatment. One was that aeration was impeded and the other was that the alkylarylsulphonates were not completely destroyed, with the result that some appeared in the effluent. Experiments by the Water Pollution Research Laboratory showed that in a river there was a two-fold effect. On the one hand there was a deterioration in the actual quality of the effluent and on the other there was a reduction in the capacity of the river to cope with the residual organic matter in a sewage effluent. It was suggested that a remedy should be sought to try to prevent the appearance of residual synthetic detergent in sewage effluents. Research was proposed towards the possible production of detergents on an economical basis which were just as efficient as the present detergents but which would be biologically destroyed in sewage disposal works. Reference was also made to claims originally made in the U. S. of control of foam by the simple expedient of increasing the activated sludge solids in circulation. Experiences at Halifax and Motherwell Works failed to reduce the foam to any extent by increasing the solids concentration in the mixed liquor above the 3,000 ppm considered in the United States to be the limiting value. It was indicated that 18.2 ppm of surface active material was present in Mogden's sewage, much higher than the 8 to 10 ppm which was invariably found in London sewage.

"Synthetic Detergents in Relation to the Purification of Sewage: Experiments and Operating Experiences at the Mogden Works." An abbreviated report of the discussion of the original paper, by William T. Lockett. *The Water and Waste Treatment Journal,* May-June, 1957.

Other Articles

"San José's New *Primary Plant*: Model of Design, Lesson in Economics." By Frank M. Belick. Public Works, July, 1957.

"Sewage Treatment Processes. II. Design of *Bar Screens*: *Disintegrators*: *Comminutors.*" By L. B. Escritt. The Water and Waste Treatment Journal, May-June, 1957.

"Two Procedures for *Grit Chamber* Design." By E. L. MacLeman. Water and Sewage Works, June, 1957.

"*Color Coding* in Your Plant." By H. E. Lordley. Water and Sewage Works, June, 1957.

"*Rate Making;* For Water and Sewage Services." By Albert P. Learned. Water and Sewage Works, June, 1957.

"A Review of the Literature of 1956 on *Sewage, Waste Treatment,* and Water Pollution." This second of three sections of the review deals with industrial wastes and radioactivity. Committee on Research, Federation of Sewage and Industrial Wastes Association. Sewage and Industrial Wastes, June, 1957.

"The Valley *Settling Basin* Facilities, Los Angeles, California." By Jack M. Betz. Sewage and Industrial Wastes, June, 1957.

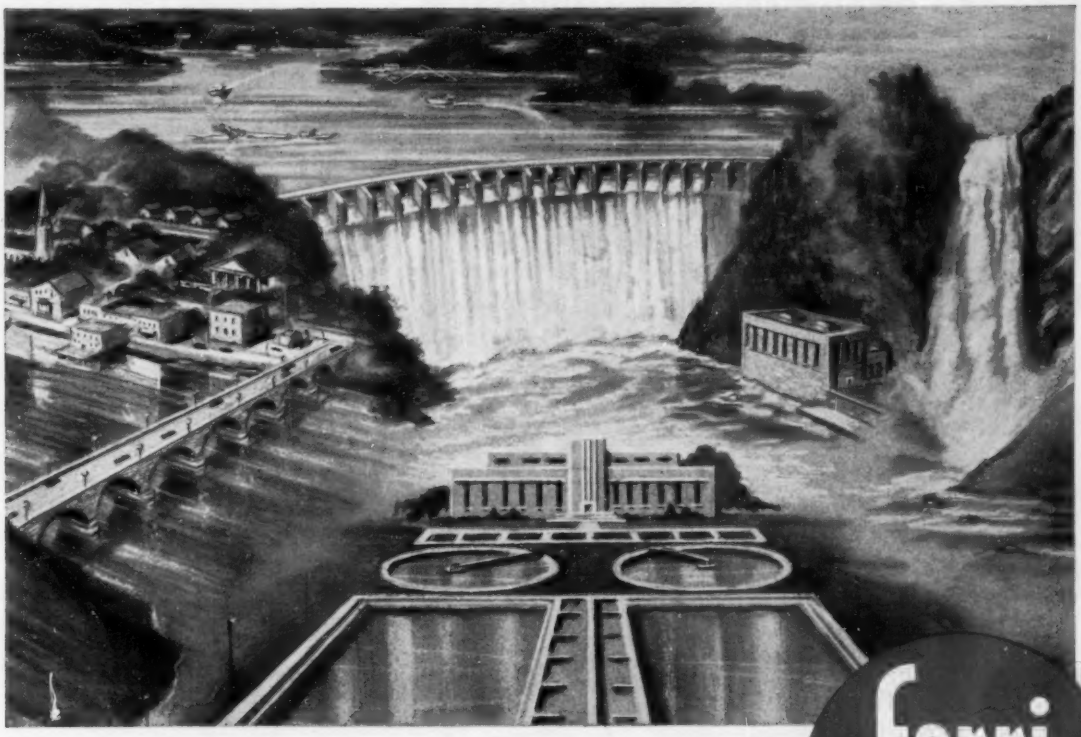
"5 New *Treatment Plants* Needed." By C. W. Bramlett. The American City, June, 1957.

• • •

Refuse Collection Day No Longer Based on Quota

The residential waste collection system of Akron, O., has ended its former system of allowing refuse collection crews to stop work when a fixed quota of collections have been made. Instead, the force will work a full 8-hour day.

High-Rate Operation of Trickling Filters



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- **Turbidity removal** ● **Color removal**
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High-Rate Operation of Trickling Filters

A summary of recent literature.

A. PRESCOTT FOLWELL

Reports on high-rate operation of trickling filters during the past two years confirm conclusions reached previously concerning the efficacy of such operation and operating procedures. At the Texas Engineering Experiment Station, it was found that the BOD removal increased from 300 lb. per acre-foot per day at 400 lb. loading to 950 lb. at 1750 lb. loading but decreased as loadings exceeded that. With recirculation, more nitrates were present in the effluent due to the secondary filtration, but the rate of nitrification decreased up to loadings of 3000 lb., when it ceased altogether. The hydraulic rate had a significant effect on filter performance, the BOD concentration in the effluent decreasing inversely as the hydraulic rate, dilution being an important factor in recirculation.

Intermediate sedimentation in series filtration did not seem to be necessary. Series filtration afforded a higher degree of treatment than single-stage filtration, even at a higher hydraulic rate.

Charlotte, N. C. in 1956 completed a plant for treating 10 mgd of sewage which contains large quantities of industrial wastes on trickling filters embodying recirculation. To absorb sudden heavy loads of industrial wastes, the sewage is first passed through roughing trickling filters 4 ft. 2 in. deep; then recirculated effluent is added. The remaining effluent is aerated and passed through secondary clarifiers.

Halifax, England since 1946 has been developing a system of modified recirculation in which the diluting liquid is effluent from aeration tanks. By June, 1955, a definite operating procedure had been adopted. The weak night sewage is not diluted; the daytime sewage is diluted to 3.20 times its volume, the average 24-hour dilution factor being 1.92. The filter effluent so produced is superior to that obtained at the same time by filters operated without dilution.

• • •

Use of Water Declines in Toledo

Water use in Toledo, O., declined 4.9 percent during 1956. Heavy industry and large commercial consumption increased, but domestic consumption dropped 2.2 percent; and railway and oil processing use also was smaller. Unaccounted for and unmetered water increased from 9.6 percent to 10.1 percent of pumpage.

EXPERIMENTAL HIGHWAY of Pre-Stressed Concrete

AN EXPERIMENTAL 600-foot stretch of highway that may have a revolutionary effect on present methods of highway construction has been built by Jones & Laughlin Steel Corp.

The project represents one of the first full-scale efforts on the part of private industry to find a solution to this phase of the nation's pressing highway construction problem.

Last September, after several years of planning, earth-moving equipment began excavating a level roadbed near the Graham Laboratory for J&L Research, on a 742-acre site on Baldwin Hill, in the City of Pittsburgh adjacent to Baldwin Borough.

The experimental roadway is of pre-stressed concrete design. The pre-stressing operation was carried out in February. Extensive tests on the roadway will be carried out in the coming months.

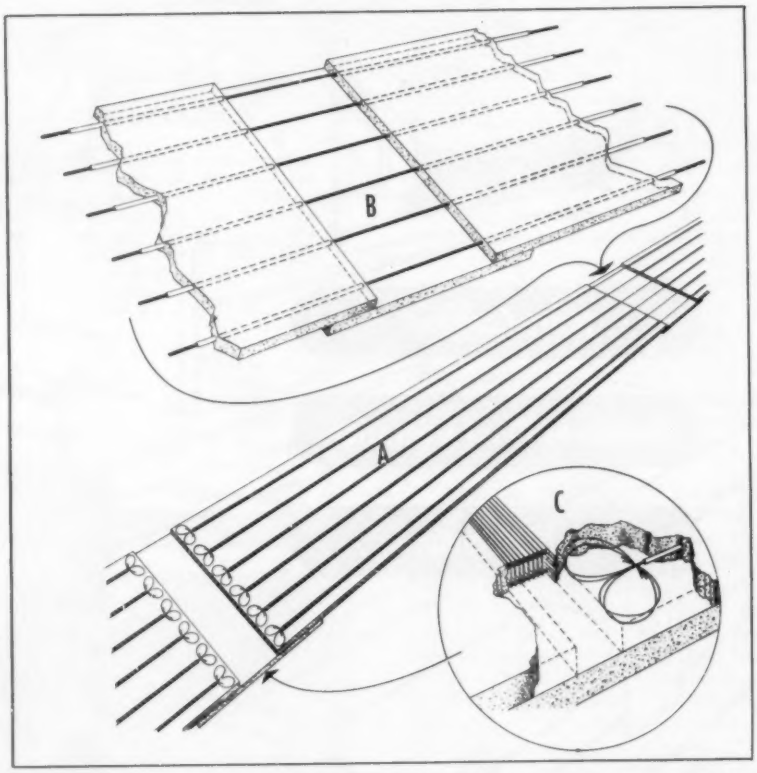
The advantages of pre-stressed concrete have been known for some time. Numerous bridges and other structures have been built of pre-stressed concrete. One of the most recent was the 24-mile bridge across Lake Pontchartrain in Louisiana.

Essentially, the J&L experiment consists of anchoring connecting wire strands at opposite ends of a 400-foot section of roadway to be formed. The strands pass through flexible steel conduits which are embedded in the concrete.

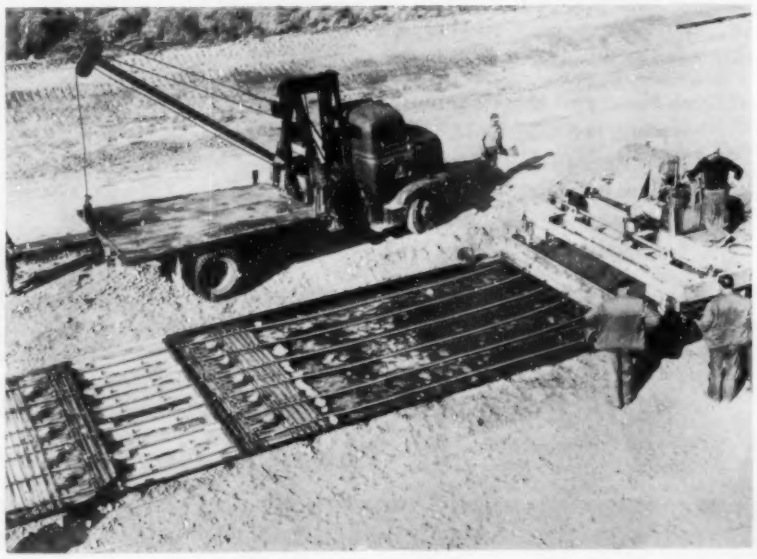
When the concrete for the pre-stressed section was poured, a six-foot gap was left in the middle of the section. For the pre-stressing operation, hydraulic jacks were placed longitudinally in the gap. When the concrete set, the gap was jacked apart to a width of eight feet, far enough to produce the required tension in the wire strands, and consequent compression in the concrete.

When this was accomplished, the jacks were removed (a special device was developed to hold the sections apart while this was done) and concrete was poured into the gap.

Thus the entire 400-foot section of concrete was placed in compression as a result of the tension in the em-



● **ABOVE: A is overall view of slab; B is enlarged view of gap; C is end detail. Below is a photograph of construction procedure. Jacks are placed in the 6-ft. gap.**



bedded steel strands. The concrete slab is five inches thick whereas most present-day highway pavements are 10 inches thick.

Present highway construction practice requires transverse joints at a maximum spacing of about 60 feet. These joints are necessary in concrete construction to allow for expansion and contraction. If the joints were not present, the concrete would crack.

However, the area around the joints is the place where most concrete eventually deteriorates because heavy loads, such as big trucks, press down on the edge of the concrete and create a "pumping" action.

The J&L pre-stressed section is 400 feet long. Thus seven joints are eliminated in every 400 feet. The concrete, although only five inches thick, is in compression, making it much stronger, right up to the joint.

The joint in the J&L experimental road will have to be wider than the conventional joint because it will have to compensate for the expansion and contraction of 400 feet of concrete, rather than the customary 60 feet.

To find a suitable joint for such a width, the B. F. Goodrich Industrial Products Company has been conducting research, in collaboration with J&L. A prototype of a satisfactory joint has been made. A full-size joint soon will be installed and tested as part of the research on the experimental concrete section.

The joint, which is 12 inches wide and extends the full depth of the concrete slab, is designed to allow the top surface to remain level during maximum expansion and contraction of the concrete sections. It includes a series of metal plates bonded to rubber to carry the vertical loads that traffic will impose on the joint.

In addition to the main 400-foot section, a 100-foot pre-stressed section has been placed at either end, bringing the total length of the experimental road to 600 feet. Thus two joints will be made available for testing.

The project is under the direction of J. E. Morris, J&L's director of product development. John J. Murray is Development Engineer in charge. Engineering work on the project was done by Richardson, Gordon & Associates, Pittsburgh consulting engineering firm.

The construction work is being done by Allegheny Contracting Industries, Inc., of Pittsburgh. Test specimens were studied at Carnegie Institute of Technology under the direction of Dr. Charles F. Peck. The instrumentation for testing of the pre-stressed section was designed by the Fritz Laboratory at Lehigh University, under the direction of Professor W. J. Eney.

• • •

Legislation on Control-of-Highway-Access

Control-of-highway-access legislation has been considered in at least 18 states. Minnesota and New Mexico have approved legislation providing for comprehensive controlled-access laws, while such legislation is pending in North Carolina. Amendments to controlled-access laws are pending in California, Maine, Oregon, Pennsylvania and Texas. Legislation to deny the use of controlled-access highway rights-of-way for the establishment of service facilities or other commercial facilities has been approved in 3 states, Colorado, New Mexico, and Tennessee, and is pending in 7 states—Connecticut, Delaware, Massachusetts, Michigan, Nebraska, South Carolina and Vermont.

PUBLIC WORKS DIGESTS

Prepared by
FRANK FORCE
Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Pressure-Treated Wood Posts

Pressure-treated guard-rail posts have a longer service life than untreated posts. The pressure-treating process itself consists of impregnating the wood with preservative by means of pressure. Preservatives used may be classified into creosote mixtures, oil-borne chemicals such as pentachlorophenol, and water-borne salts. Treated posts can be installed with hand tools or power auger, or they can be driven with a power driver. The posts give good visibility against both green foliage and white snow. Reflectors can be used for added night visibility. If painting is required, treated posts can be painted after a short period of weathering.

"Pressure-Treated Wood Posts in Modern Highway Construction." By W. G. D. Hungerford, Field Service Representative, Canadian Institute of Timber Construction. *Roads and Engineering Construction*, May, 1957.

Landscaping In Turnpike Design

Landscape planning on the Connecticut Turnpike was begun during the highway design stage. The six major factors considered in the planning were safety, screens, sound attenuation, glare protection, monotony and economy of maintenance. Existing plant material was used where suitable. Most of the screen and sound attenuation plantings are to be of evergreen trees on fill areas. In cut areas, shrub beds will be used generally, with a small number of deciduous trees. In a number of large cities, there will be no attempt to use screen or sound attenuation planting, because of no room available. In residential areas, the primary importance is the protection of the adjacent homes from noise, lights and blight. In rural areas, planting will be made only where necessary, such as at interchanges and at locations where screen and headlight glare plantings are required. Median screen planting will be made only on horizontal curves. Large evergreens will be used to screen off the railroad right-of-way which follows the turnpike for a considerable distance. There is a minimum plant setback from the pavement of 5 ft. for the safety of maintenance personnel.

"Landscaping: Full Partner in Turnpike Design." *Engineering News-Record*, June 13, 1957.

Stopping Ability of Motor Vehicles

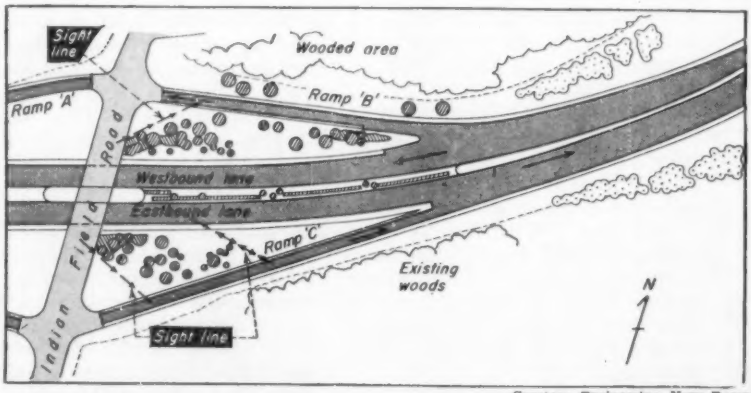
The results of tests conducted during 1955 on more than 1200 vehicles selected at random from general traffic are presented. It compares past and present levels of brake performance and shows that improvements in the brake performance of most vehicle types since 1949 have been small. Current performance levels are reported according to vehicle type, gross weight, vehicle capacity and axle load. The improvement in general levels of brake performance was smaller between 1949 and 1955 than it was in the earlier period, 1942-49. Only the 3-axle truck-tractors with 2-axle semitrailers and the truck-tractor-semitrailer and full-trailer combinations showed substantially better braking in both periods. The smaller amount of improvement made by most vehicle types since 1949 indicates that the wide range in stopping abilities which exists among the various types will not be appreciably reduced in the near future. Consequently, this range must be taken into account in highway design, vehicle regulation and driver training.

"Stopping Ability of Motor Vehicles Selected From General Traffic." By F. William Petring, Highway Transport Research Engineer, Bureau of Public Roads. *Public Roads*, June 1957.

Lean Mix Concrete Bases

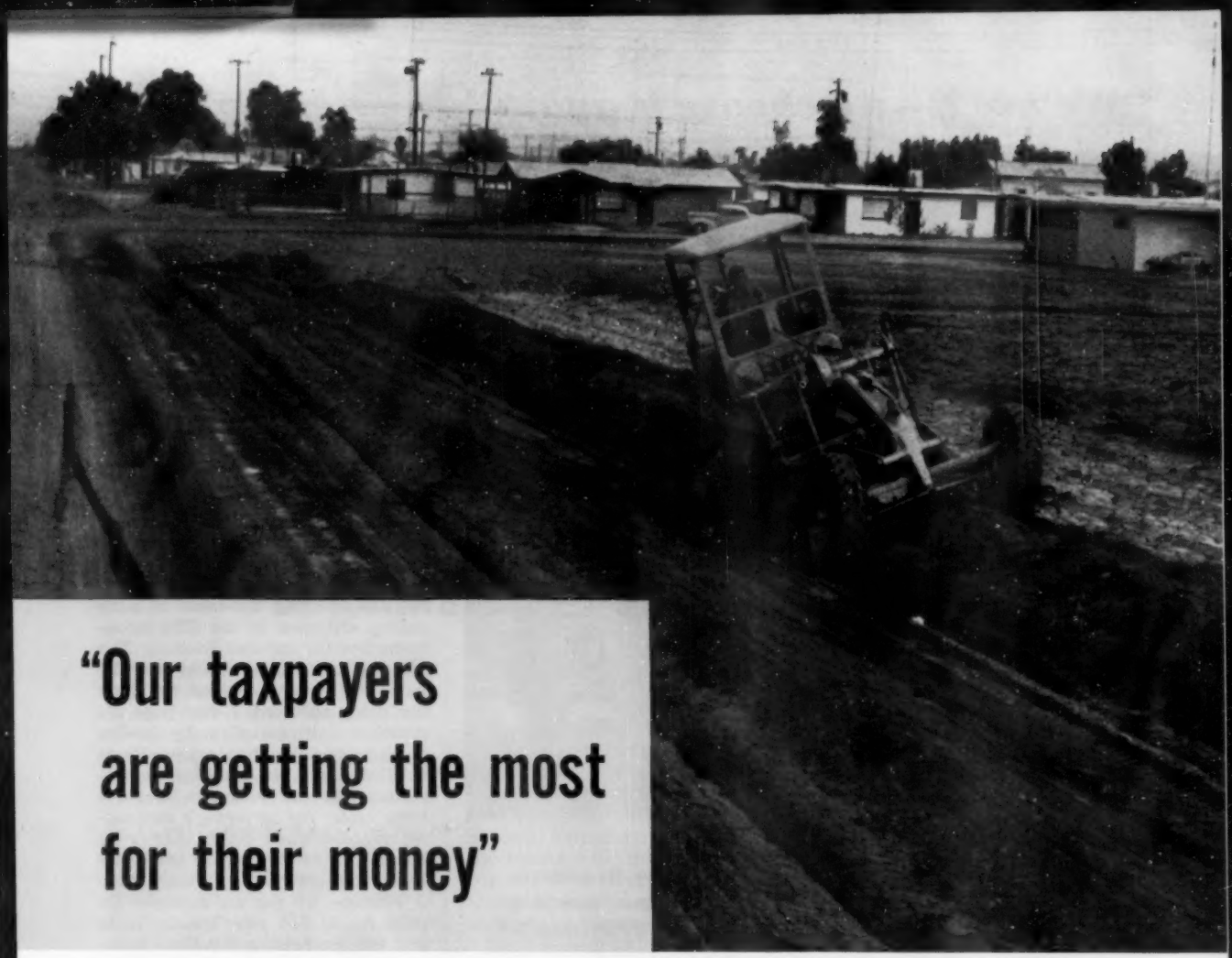
Lean concrete construction is economical in cement, simple in technique and produces a finished product of good riding quality. The method of construction is quickly learned by an untrained gang and it has been proved suitable for large or small jobs under a wide variety of site and weather conditions. Although largely used for site development work where there are frequent changes of cross-section, camber and interruptions by junctions, it also appears well adapted for main road work. Somewhat loosely spoken of as a semi-rigid pavement, it does have many of the advantages of a rigid base with the first class riding qualities associated with bituminous surfacing. It is competitive in price with reinforced concrete and additional experience in its use should lead to economies.

"Lean Mix Concrete Bases At



Courtesy Engineering News-Record

● **LONG SIGHT lines are stressed for "on ramp" traffic so that drivers can see entering vehicles, but the "off" ramps are blocked from sight by careful plantings.**



"Our taxpayers are getting the most for their money"

In those words Supt. of Public Works James W. Clevenger sums up the job a CAT* No. 212 Motor Grader does for the City of Imperial, California.

The municipality has 26 miles of streets. All maintenance and new construction are handled by this one machine. Its first assignment was building 1½ miles of road, from sub-base to finish. As Mr. Clevenger says, "It does big jobs as well as little ones. With the service it gives us, along with the small amount of down time, we feel our taxpayers are getting the most for their money."

Hundreds of communities have found this motor grader the answer to their road maintenance problems. Though it's the smallest and lowest priced grader in the Caterpillar line, the No. 212 is ruggedly built for the hard work.

Its powerful Cat Diesel Engine, positive acting controls, full range of blade positioning without leaving the cab, and excellent job visibility make the machine easy to operate. Tubeless tires, at no extra cost, reduce tire down time by 80%.

You will find one of Caterpillar's quality line of Motor Graders, the No. 12, No. 112 or the No. 212, is exactly right for your city's needs. Ask your Caterpillar Dealer for a demonstration and cost figures. His prompt, reliable service and parts you can trust will protect your taxpayers' investment.

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Crawley." By Maurice Milne, Chief Engineer, Crawley Development Corp. *Roads and Road Construction*, May, 1957.

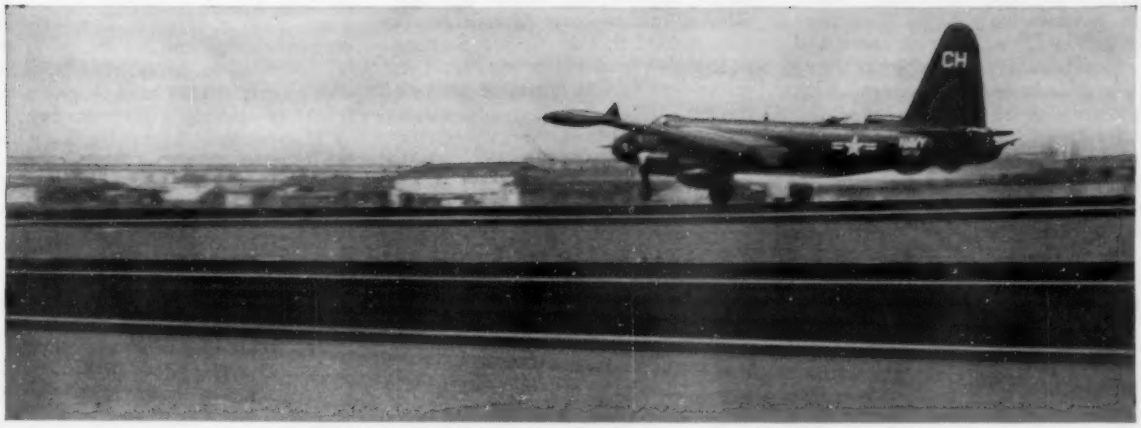
War on Litterbugs Can Never Be Relaxed

Through a well-organized citizens' group known as "The Governor's Committee to Keep Maryland Beautiful," the habits of more than 2,000,000 people in Maryland are slowly changing. There is one state wide "Cleanup Week" each year with 51 weeks of gentle but persuasive pressure to keep it clean. With the governor, the state departments and the county commissioners well organized, sub-committees were established to fight littering. The enforcement of the state's anti-litter law was recommended and the road commission cooperated by preparing and erecting hundreds of signs calling attention to the $250 maximum fine for careless littering. The state police cooperated and with the help of the local judges the laws are being enforced. Litter bags are distributed to motorists by garden clubs and other civic organizations and litter cans are placed at service stations for the collection of these litter bags. The governor's committee suggests these things that every citizen can do: 1) Get the anti-litter habit and always put trash where it belongs; 2) Set an example for children; 3) Let your friends know that you are fighting this litter problem and urge them to do the same; 4) Insist on enforcement of Maryland's anti-litter laws.

"War on Litterbugs Can Never Be Abolished." By Charles T. LeViness, Public Relations Director, Maryland State Roads Commission. *Better Roads*, May.

Roadside Weed Control With Rotary Cutters

Kansas has experimented with rotary cutters that were mounted on the rear of a tractor and with trailer type cutters that were trailed behind the tractor; now they are trying a cutter that is mounted amidship under the tractor. A higher framed tractor with larger diameter wheels and power steering is specified on the tractors with the center under-body units. A minimum of 30 hp was specified for the 60-66-in. under-mounted cutter and 42 hp for the 90-in. machine. Rotary type machines are useful in shoulder mowing as the tractor can be operated entirely off of the traveled way. These mowers will cut fairly high growth, however, a second



Navy gets double savings with Bitumuls Slurry Sealing of Runways at Jet Training Station

ONE of the busiest military air installations on the entire West Coast is the Alameda Naval Air Station. In addition to heavy traffic in propeller-driven aircraft, Alameda is an important West Coast jet aircraft training center.

Runway Construction—The runways of this Naval Air Station are surfaced with asphaltic concrete, placed over a 6" course of Bitumuls Sand Mix. The wide shoulders adjacent to these runways are also Bitumuls RS-1 Chip Seal. The surfacing was placed some four years ago, and recently showed signs of weathering. Close

Bitumuls Slurry is chuted into spreader-box as mix-truck travels at speeds up to 5 MPH.

inspection disclosed some ravelling; minor hair-cracks on the surface; and some loose material. This loose material, while of little importance during the days of conventional-type aircraft, had become a major source of expense after jets started operating here. Sand, small stones, and other loose material can cause considerable damage, when scooped into the jet engines.

A Dual Problem—The Navy was looking for answers to two problems: First, a method of revitalizing the runways and extending the life of the pavement surface. Second, a means of cutting down the repair bills involved when jet engines were damaged by loose material scooped up from the surface of the runways. *They found a single answer to both these problems in Bitumuls Slurry Seal!*

Bitumuls Slurry Seal composed of fine, sharp aggregate, Bitumuls Mixing Grade emulsified asphalt and water, was mixed in transit-mix trucks to a free-flowing, slurry consistency. It was applied by the squeegee action of a spreader-box to 350,000 sq. yards of runway and taxi-way. Contract for this work was awarded to George Reed, a contractor from Modesto, California.

To offset the high abrasive action of the aircraft tires on landing, a dilute (3 to 1) Bitumuls tack coat was placed ahead of the Slurry Seal to insure maximum adhesion.

Fast-Fast Application—It was "business-as-usual" at the Air Station while this work was in progress. In spite of the additional requirement of the tack coat, Bitumuls Slurry Sealing reduced interference with air traffic to a minimum. Planes at the Station were able to taxi over the fresh seal coat four hours after application. Jet aircraft landed on the new seal 24 hours after application.

The costs involved in providing this new life for the existing runway pavement was considerably less than that of a normal seal coat application.

"Meanwhile, at the Hangar..." In the repair shops, an extra "bonus" economy will be realized because Bitumuls Slurry Seal has eliminated loose material from the runways. *The cost of mechanical repairs occasioned by the induction of foreign material through the jet engines is expected to be sharply reduced.*

A Proved Procedure—Bitumuls® Slurry Seal has been proved on many installations—on highways, streets and airport runways—in terms of economy of initial application, and also in terms of durability. It can be applied in any quantity or volume for either construction or maintenance. Call our nearest office if you need additional information. It will be given gladly; and, of course, without obligation.

pass is sometimes necessary where this is excessively high. Also, they are suited for wide even areas and for interchanges. Most units have chain guards or shields to prohibit the throwing of debris.

"Roadside Weed Control With Rotary Cutters." By L. J. Siler, Engineer of Maintenance, State Highway Commission of Kansas. PUBLIC WORKS, July, 1957.

Establishing Turf With The Use of Asphalt

Turf, to have a part in highway consideration, must be established economically, maintained easily, and function satisfactorily. There are several methods of mulching used in the state of Ohio, where asphalt emulsion is applied. The first method used was the application of either a cutback or an asphalt emulsion sprayed over a seeded area. The asphalt cutback was applied at the rate of a minimum of 0.2 gallon psy on all areas except ditches where 0.3 gallon psy was used. Another method of mulching is where liquid asphalts are used to tie down the straw by spraying a thin film of bituminous material over the straw after it has been spread. A third method of mulching is where the liquid asphalt and straw are applied simultaneously. Asphalt emulsion is used in this method because it is stable and nearly as liquid as water and can be handled without heating. It can be used with damp straw and it atomizes easily giving a uniform spotty tack to the mulching material. Also, the blast of air necessary to blow the straw, into which is sprayed the emulsion, rapidly dissipates the moisture in the material thereby giving an immediate tack.

"New Method of Establishing Turf With the Use of Asphalt." By Wilbur J. Garmhausen, Chief Landscape Architect, Ohio Dept. of Highways. PUBLIC WORKS, July, 1957.

Maintenance Aggregate Supplied By Contract

The Montana State Highway Dept. has awarded the production of its crushed rock to contractors rather than to attempt the work with its own forces and equipment. In the Missoula district alone 157,500 tons of material were screened and stockpiled during the 1956 season by one contractor. This contractor used a Pioneer 46 V-E Duplex crushing and screening plant with a set of dual 4 x 12 vibrating screens, a 10 x 36 jaw crusher and a set of 40 x 22 rolls. The plant is on rubber and can be moved from place to place quite readily. The unit averaged 1250 tons output each 8 hours, working a 16-hour day.

"Maintenance Aggregate Supplied by Contract on Area Basis." *Roads and Street*, June, 1957.

Locating Gravel Sources

In this article several techniques for locating gravel sources are considered, but it is not concerned with the quality of the material. Gravel deposits came from masses of ice, thousands of feet thick, that crept across Canada and northern areas of the United States. The discussion of land forms is confined to those glacial landforms in which the glacier "Fillings" (boulders, cobbles, gravel, sand, silt and clay) were sorted by rapidly flowing water. The six landforms likely to contain sand and gravel are eskers, kames, beach ridges, deltas, outwash and terraces. There are four general rules to follow in locating possible gravel deposits. They are: keep your eyes and ears open, check agricultural soil maps, check available geologic information for your

area; and rely on aerial photographs as the most complete inventory of possible gravel deposits. Aerial photographs studied with a stereoscope, can be helpful in locating likely sources of gravel. The photographs are inexpensive and, with some practice, permit a rapid and complete search for gravel landforms. Studying the lists of identification characteristics will be helpful but, generally, these five questions can be asked about any landform in question: 1) What is the shape of the landform? 2) What does the stream or drainage pattern look like? 3) If there are any gullies, what do they look like? 4) Is there much vegetation? 5) Is the tone on the photograph relatively light or dark?

"Locating Gravel Sources For Highway Use." By J. W. Spencer, Highway Research and Extension Engineer, and O. K. Dart, Jr., Instructor, Dept. of Agricultural Engineering, Cornell University. PUBLIC WORKS, July, 1957.

Training For Highway Work

A student-engineer summer program was initiated in the Michigan Highway Dept. in 1946. Today the program has grown to average 200 engineering students each summer. These students are paid in proportion to the level of their years in college and at the end of each summer's work they are granted a leave of absence to continue their education. The program has two purposes. It has enabled the highway department to supplement its field forces during the heavy part of the construction season. Also, it has given the student an intimate insight into highway engineering. The engineer-in-training program for graduate engineers was inaugurated in 1949. Following the completion of the rotation part of the trainee program, the young engineers are in a position to receive permanent classifications in the department in a specialized field of work. In a long-range program to secure engineering aids, the state and the University of Michigan have started to give an 8-week course of study in highway surveying to qualified high-school graduates. To qualify for the program it is necessary for high school graduates to have completed a high-school course in trigonometry, to have satisfactorily met entrance requirements of the university's civil-engineering department and to have passed successfully the civil-service examination for engineering aide. In-service

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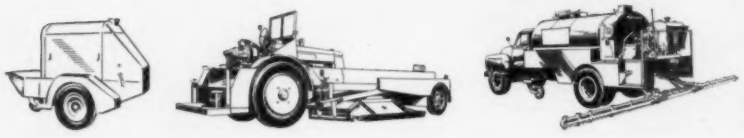

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training programs are being conducted for all employees in the use of aerial photographs, photographic scales, mosaics, stereoscopic theory and stereoscopic interpretation problems.

"Training For Highway Work." By Merle J. Walker, Director of Personnel, Michigan State Highway Dept. *Better Roads*, June, 1957.

Good Streets At Low Cost

Missoula, Mont., has 240 miles of streets to rebuild and only $70,000 available for this purpose each year. A roadmixed bituminous paving to be placed on adequate base construction with ample drainage provisions was adopted as the type of street to be constructed. The city purchased two motor graders, Seaman-Andwall Trav-L-Plant, pneumatic and steel-wheel rollers, four dump trucks, two tractor-mounted front-end loaders and some snow plowing equipment that could be used in street construction. The city forces and local contractors have worked together to complete several street jobs. Crews of four men, using the equipment, can work a 600-ton, 450 cu. yd. windrow of aggregate, separate and mix with 6,000 gals. of MC3 or MC5 asphalt in less than six hours time. If the majority of property owners petition for street work, the job is done. The average cost to owners is approximately $3.30 per front foot. This includes pavement restoration, correction of grade, rebuilding of sub-base and construction of drainage wells.

"Good Streets At Low Cost." By W. R. L. Taylor, City Manager, Missoula, Montana. PUBLIC WORKS, July, 1957.

Prestressed Concrete in Florida Bridge Practice

The two types of prestressed members that are used in Florida bridge practice are piles and I-shaped beams for trestle spans. Necessary strengths of the concrete used in this construction are attained by careful proportioning, the use of plasticizing, densifying admixtures, and a cement content of not more than 7 bags per cu. yd., with the average of 6½ bags. Stress transfer is made only after the concrete has developed a specified minimum strength, judged by cylinders cured exactly as the prestressed members are cured. It is imperative that the quantity of stress be checked by both the elongation of the tendons and by jacking pressures, and that results be reconciled within specified limits. Prestressed beams, with spans up to about 100 ft., are particularly adopted to mass production in standard shapes at centrally located yards. A 45° slope on the underside of the bottom flange of the beam was designed, with the junction of flange and web rounded to eliminate the sharp break at this point. A composite beam section was loaded in shear to 3 (L + I), then raised to 4 (L + I) without any detectable distress in the specimen. The bending test at 3 (L + I) produced only minor cracking of the bottom flange, and the test was considered successful at this point. The test continued until the ultimate load in bending was reached at 4.6 (L + I).

"Prestressed Concrete-Difficulties Overcome in Florida Bridge Practice." By W. E. Dean, Engineer of Bridges, Florida Road Dept. *Civil Engineering*, June, 1957.

Croatan Sound Bridge—Three Miles Long

THE THREE-MILE LONG Croatan Sound Bridge between Mann's Harbor and Manteo, North Carolina was under construction for over two years. The location for the bridge was made under the direction of Hydrographic Engineer W. S. Winslow during the winter of 1953-54. After the location had been decided upon, the State Bridge Department under Chief Bridge Engineer T. B. Gunter, Jr., prepared the construction plans. T. A. Loving and Company of Goldsboro was the contractor for the job.

Concrete piles, ranging in length from 32 to 87 feet, were pre-cast in a yard and then ferried out to the construction site where they were driven and then topped by concrete caps.

Building the 14,265-ft. long bridge required two 40-ft. long spans; 278 of the 42½-ft. long spans; 32 of the 70-ft. spans; and the 130-ft. long navigational span which has a 45-ft. vertical clearance and an 80-ft. wide horizontal clearance for passage of boats.

Quantities for the bridge included 14,657 cubic yards of concrete; 5,887,780 pounds of reinforcing steel; 6,735,700 pounds of structural steel; 66,146 lineal feet of 20-ft. octagonal precast concrete piles; and 22,998 feet of 22-ft. octagonal precast concrete piles. Fenders were built to protect the foundation caps of the channel navigation span. The bridge has a 24-ft. wide clear concrete roadway with concrete rails.

The structure cost $2,649,123.88, including the contract cost and the engineering fees. It was financed by a special $750,000 allocation in October, 1953; and a $2 million allocation in November, 1954 by the State of North Carolina.

Other Articles

"The *Right Equipment* Makes the Job Easier." Merced, Calif., adopts continuing program for street and alley maintenance. By W. A. Presseller, Supt. of Public Works, Merced, Calif. American City, June, 1957.

"Highway Engineers Discuss *Traffic Flow*." Recommendations to improve congested streets. Contractors Record and Municipal Engineering, May 8, 1957.

"*Trench-Filling* Needs As Much Care As Road Laying." By F. Smith, Works Supt., Highways Dept., Leeds. Municipal Engineering, April 19, 1957.

"Improving *Public Works Programs* Through Research." By J. H. Euston, Vice President, Business Research Corp., Management Consultants, Chicago, Ill. Public Works, July, 1957.

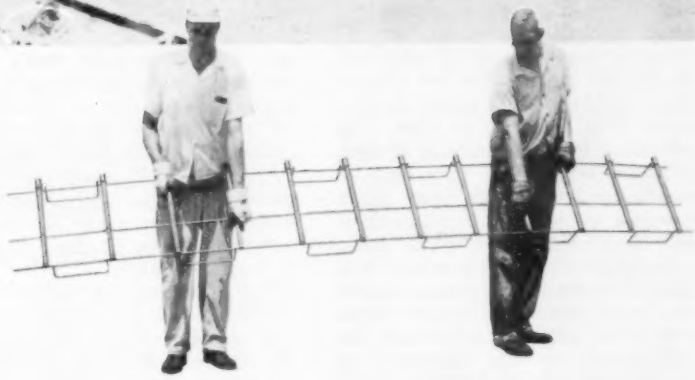
"*Rubber-Asphalt Paving* For Playgrounds and Recreational Areas." By H. V. Carlson, Xylos Rubber Co., Div. of Firestone Tire & Rubber Co. Public Works, July, 1957.

"Evolution of the *Road Map*." By James L. Creasy. Highway Magazine, June, 1957.

"How States are Adapting *To Meet Material Shortages*." Roads and Streets, June, 1957.

"*Photogrammetry* for the Highway Engineer." By A. O. Quinn, Chief Engineer, Aero Service Corp., Philadelphia, Pa. Civil Engineering, June, 1957.

"*Clay-Lime Stabilization*." Texas Highways, June, 1957.



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Operation of a County Asphalt Plant

C. E. WRIGHT

TEN YEARS ago the Duval County Highway Department at Jacksonville, Fla., had 440 miles of paved county roads to maintain, which it did with $225,000 worth of equipment. Today there are 650 miles, which require an equipment inventory of $800,000. The large expansion of maintenance work on county highways, which also include many miles of dirt roads, is accounted for by a rapid increase in suburban population and the opening of many new subdivisions.

Latest addition to the county's highway equipment is a Cedarapids asphalt mixer, which replaces a home-made rig that had insufficient capacity for the present road-patching requirements. It produced only five tons an hour. The new plant has a capacity of 35 tons an hour, which will take care of county road needs for many years to come. At present it is operated only about one-fourth of the time.

Although the asphalt mixer is a portable model, it has been utilized as a stationary plant on the property of the Duval County Highway Department on the outskirts of Jacksonville. Hauling distances from the plant to the farthermost limits of the county do not exceed 25 miles.

Auxiliary equipment of the mixing plant includes a 10,000-gal. asphalt tank and a 4,000-gal. fuel oil tank; a Minneapolis-Moline tractor with a 1-yd shovel; a Hough Payloader; and Mack and Ford trucks. The Mack trucks are of 12 cu. yd. capacity and are used to haul sand. The Fords with dump bodies of 7 cu. yd. capacity are used to haul the asphalt mix to highways that are being repaired.

The mixer is operated by five men, two skilled and three common labor. These men are used to run the patch trucks on days when the mixer is not being operated. The M-M tractor and the Payloader are used to load materials into the hopper of the mixer and to load trucks from the stockpile of asphalt mix on the ground. Hoppers can be loaded in three minutes and trucks in five minutes when the mix is taken from ground piles, but in less time when the mixer is operating and dumps from a hopper direct into the truck bodies.

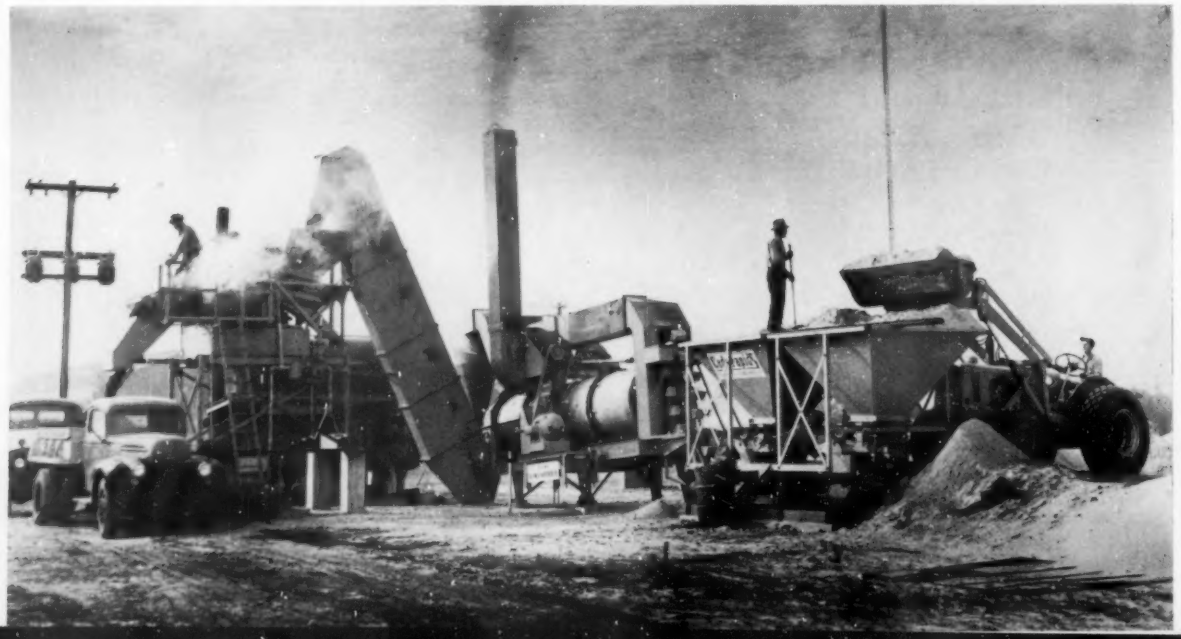
Duval County uses an RC-1 mix of 5.85 percent asphalt and 3.1 percent asphalt cement. The sand is 80 percent natural sand and 20 percent building sand, which is hauled from pits four miles away. The mix is used either hot or cold, but the experience of the Duval highway engineers is that it works better when cold.

At one time the department used 3-cu. yd. dump trucks, which had to return to the plant for a second load before the day was over. The 7-cu. yd. dumps can take sufficient mix for an entire day's operation, thus effecting a substantial time saving. Actual cost savings from the new and more efficient mixer have not yet been worked out, but John Crosby, county engineer, is certain they will prove to be fairly substantial in addition to providing more rapid patching service wherever required. The county highway organization prides itself on having been able to keep its roads in good condition with a minimum of delays.

The county is divided into five districts, each of which has about 20 men under a foreman, who handle drainage problems as well as highway maintenance. A dragline, a bulldozer and other equipment are stationed in each district. When in need of repair or maintenance work, these machines are brought back to the central maintenance shop in Jacksonville. The county engineer says this method has effected economies as against having a maintenance shop in each district.

Florida's heavy rains require constant watchfulness of roads and ditches. Three field engineers are cruising most of the time to spot road damage and ditch clogging, if possible before complaints come from county residents. As a result, such complaints have been reduced to a minimum.

● NEW Duval County asphalt mixing plant has a capacity of 35 tons an hour but is operated now at much below capacity.



PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Phosphates in Water Treatment

Sodium phosphate glass or glassy phosphate (sodium hexametaphosphate) was first used for municipal water treatment at a small Ohio city in 1938. Today over 2,000 municipalities throughout the United States provide water that has been treated with glassy phosphate to prevent deposition of calcium carbonate scale, to control corrosion, to stabilize dissolved iron or manganese, or for a combination of, these purposes. A schematic diagram of a typical glassy phosphate feed equipment installation is shown in the accompanying figure.

"Glassy Phosphates in Water Treatment." By George L. Illig, Jr. *Journal of the American Water Works Association*, June, 1957.

Maintenance of Rock Wells

As a result of 30 years of experience with various methods of well maintenance it has been concluded that dynamiting, as outlined in this article, is by far the best way to control decline in yield caused by plugging of a well. It is felt that 10-lb. shots at 5-ft. intervals do a better job than 100-lb. shots at greater spacing. It is possible that 5-lb. shots used the entire depth of the well may give as good results as have been obtained using 10-lb. shots. Pumpage and water level graphs for several of the wells in Lansing treated by dynamiting are shown in this article and demonstrate the increased yield obtained.

"Maintenance of Rock Wells." By Claud R. Erickson and Ralph C. Wright. *Journal of the American Water Works Association*, June, 1957.

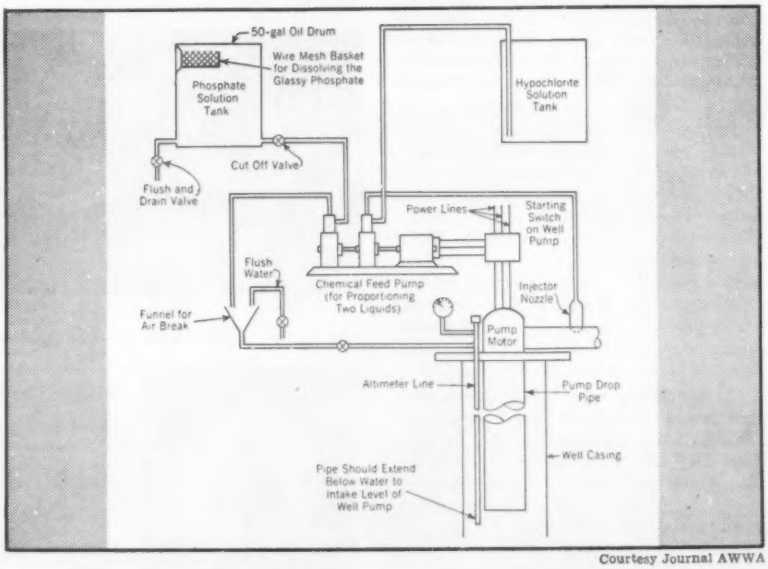
Radioactive Tracers

Studies are described in which radioactive tracers were used singly and in combination with either dye or chemical tracers in several phases of sanitary engineering. Of most importance to the profession have been the studies utilizing these new tools for the measurement of longitudinal mixing in pipes; for determination of flow time and dispersion in watercourses, artifical basins, and ground water; for tracing distribution of pollution from ocean outfalls; for evaluation of the removal of bomb debris from the atmosphere by the environment and by water treatment plants; and for rapid detection of coliform organisms. The studies described in this article are some of those being carried out at the Robert A. Taft Sanitary Engineering Center in Cincinnati.

"Radioactive Tracers in Sanitary Engineering." By Conrad P. Straub and G. Richard Hagee. *Journal of the American Water Works Association*, June, 1957.

Aerating Reservoirs

Prior to July 1956, Indian Brook Reservoir at Ossining, N. Y., was a typical stratified reservoir 28 ft. deep and having a capacity of 103 mg. Various methods for increasing the natural bicarbonate alkalinity of the reservoir water (normally 14 to 18 ppm) had been considered prior to this time to aid coagulation. Also the alkalinity of the finished water (after the addition of secondary lime to raise pH to 8.6—9.0) had been insufficient to control corrosion adequately. In July the reservoir water was completely recirculated by the installation on this reservoir of a floating aerator of original design. Free air at the rate of 160 cfm was continuously discharged through air release nozzles set on 1-ft. centers at approximately 7½ ft. below the water surface. Three 2-in. diameter plastic hose lines (each 400 ft. in length) were wired together and extended from the filter plant to the aerator. Two of these convey air from the compressor, their buoyancy supporting the third line, which conveys milk of lime. A series of graphs are included in the original article to show the effect of the aerator on the temperature, dissolved oxygen, pH, alkalinity, and color in this reservoir. Several potential applications are cited for this



Courtesy Journal AWWA

● **DIAGRAM showing layout of glossy phosphate feeding system for water works.**

aerator having an input of only 8 hp. The author surmises that, on a horsepower applied basis, such surface aeration has many times the efficiency of conventional methods of introducing oxygen.

"Forced Circulation of Reservoir Waters." By Thomas M. Riddick. *Water and Sewage Works*, June, 1957.

Causes of Tastes and Odors

This is a progress report on the current study of the causes of tastes and odors in drinking water. Phenolic substances can cause malflavors under certain conditions, but many other substances can do so as well, and medicinal odors are not always due to industrial wastes. Identification of specific agents is a tedious analytical problem, but progress is being made with new techniques. Laboratory data on reactions between chlorine and phenols should be viewed with caution until tested in the field. The lack of correlation between phenol in raw water and odor problems at waterworks indicates that other substances are responsible for many water treatment problems. Identification of the causes of tastes and odors is an exceedingly complicated problem which is slowly yielding to organized research. Proper corrective measures can be considered only after the causative substances have been labelled.

"The Causes of Tastes and Odors in Drinking Water." By Richard D. Hoak. *Water and Sewage Works*, June, 1957.

Conflicting Demands for Water

Conflicting demands for water thrive upon scarcity. In humid areas of abundance, conflicts exist, but it is in arid areas that they are more difficult to resolve. There have been international conflicts over demands for water, the most noteworthy being over the control of the Nile River. Egypt has sought to build the Aswan High Dam for irrigation purposes. An international conflict cited in the article relates to the Danube River which flows through or by many nations. Another of the conflicting demands lies in opportunity for hydroelectric development by diversion of the Columbia River in Canada into the Fraser River. In the United States there has been serious conflict between the several states concerned over the diversion of the water of the Colorado River principally for irrigation purposes. Also there are conflicts between water users, sometimes between one character of use and a different character of use, or competition between users for the same character of use. Avoidance of conflict in uses of water resource can best be approached through intelligent planning of each drainage basin on a multiple-purpose use basis. This may involve consideration of the gamut of water uses, domestic, industrial, municipal, irrigation, drainage, hydroelectric power, waste disposal, flood control, navigation, recreation, fish and wildlife.

"Conflicting Demands for Water." By Samuel B. Morris. *Engineering News-Record*, June 6, 1957.

Billerica's New Water Plant

The town of Billerica, Mass., placed in operation a new water filtration plant in January, 1956 which incorporated several innovations. These include the use of trays in the sedimentation basins; an 18-inch layer of anthracite coal above the 30-inch layer of sand of the rapid sand filters; solution chemical feed permitting flexibility of choice

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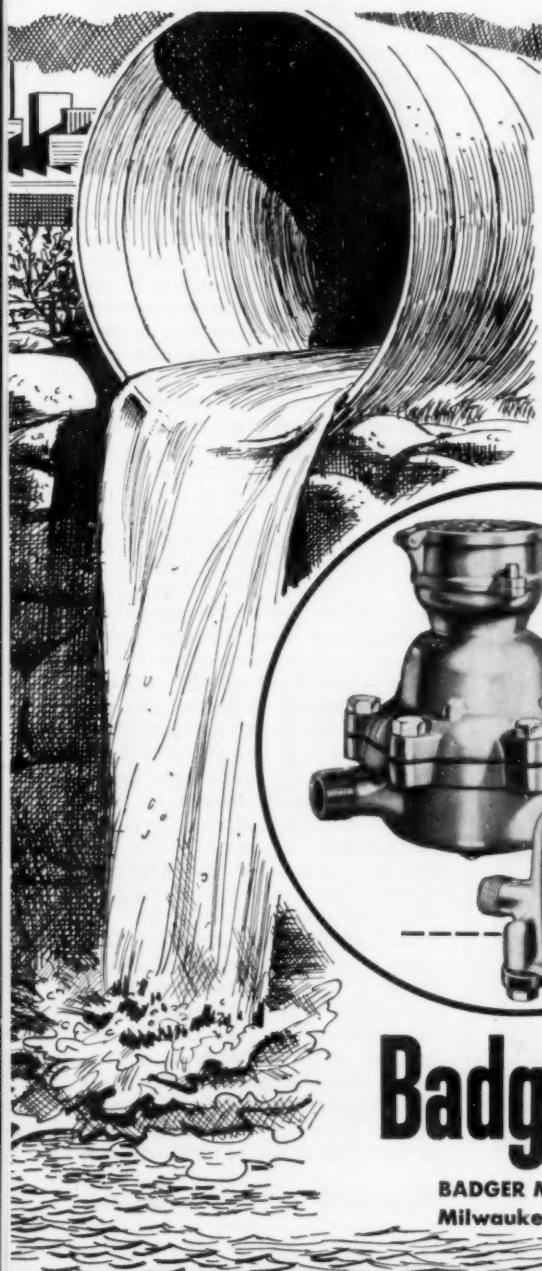

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of chemicals; the use of sodium hydroxide for alkali feeding; a system of acid cleaning of porous aluminum filter plates; and a number of automatic controls. Rapid growth of the town exceeded the potential capacity of all ground water sources, and it was necessary to construct a treatment plant capable of treating the relatively polluted Concord River water and also well water, both of which contain iron and manganese which must be removed.

"Box Score of Billerica's New Water Treatment Plant." By Herman G. Dresser. *Water Works Engineering*, June, 1957.

Combined River and Well Supply

The water treatment plant at Salinas, Kansas, is an up-to-date, versatile, flexible facility which can handle either well water for softening, river water for purification and softening, or a combination of the two. The use of 80% river water and 20% well water during the past winter has been found very satisfactory. This use of river water provided a much-needed rest of the well field and an appreciable inflow from the neighboring areas thereby resulting in a rise in the ground water table. In addition, this plant has a calcining plant capable of reclaiming lime from the sludge obtained in the softening process. The entire plant is constructed of individual units or a combination of units, each containing a particular function of the treatment process. This type of construction was adopted to facilitate expansion of the plant in the future.

"Drought—Flood Cycle Precedes Project Combining River and Well Supplies." By Nathan B. Butcher, *Water Works Engineering*, June, 1957.

Recreational Use of Water Reservoirs

In the public health sense, impounding reservoirs may be considered as falling into two general classes: those developed primarily for domestic water supply and those serving a whole spectrum of multipurpose use. This paper applies only to reservoirs developed primarily for domestic water supply. In California, as in most other areas of the country, there is a conflict of interest in proposed recreational uses of domestic water supply reservoirs. People have more leisure time with more need for recreation than in the past, and, as cities grow larger, there is less and less room for this recreation. The California State Board of Health recognizes that, in certain situations, recreational use of water supplies under proper restrictions is feasible. The two important factors to be considered in this important public health problem are (1) the hazards of disease transmission and (2) esthetic considerations. We have considerable knowledge concerning risk of disease transmission, although it is admittedly incomplete. So far as we know, the major disease potential in recreational use of water supply reservoirs is from improper disposal of human wastes, especially the feces, of those using the reservoir and watershed area. The inability to control all wastes leaves a potential hazard of some disease transmission, i.e., typhoid, poliomyelitis, coxsackie, amoebic dysentery, and the newly recognized enteric cytopathic human orphan (ECHO) viruses which appear to cause aseptic meningitis. Also the virus causing infectious hepatitis is known to have caused water-borne outbreaks. In the massive water-borne epidemic in New Delhi, India, in spite of the presence of a good water treatment plant, 10,000 cases of hepatitis occurred. The same general principles must be applied as are applied to the production of

clean and safe milk, its safety insured through the final safeguard of pasteurization. In other words, the watershed must be protected, insuring that the water will be kept as clean as possible along each step of the route. In addition, the water finally must undergo a degree of treatment consistent with the hazards to which it has been exposed.

"Limitations on the Recreational Use of Domestic Water Reservoirs." By Charles E. Smith and Henry J. Ongerth. *Public Health Reports*, June, 1957.

11 Years Fluoridation—Grand Rapids

This paper summarizes the observations of the study of water fluoridation for the past 11 years in Grand Rapids. The results of this study, together with others which have been conducted for similar periods, indicate the feasibility of this procedure for the control of dental caries. In all studies the findings show a reduction of 60-65% in the prevalence of caries in the permanent teeth of children born subsequent to the change in water supply. Furthermore, the evidence strongly suggests beneficial effects on teeth which were formed, or erupted, prior to the initiation of water fluoridation.

"Grand Rapids Fluoridation Study —Results Pertaining to the Eleventh Year of Fluoridation." By Francis A. Arnold. *American Journal of Public Health*, May, 1957.

Other Articles

"Combined Slow-Rapid Filters Scrapped for Contact—Clarifier *Filter Plant.*" By Joseph F. Golden. Water Works Engineering, June, 1957.

"A Future *Water Requirements* Study." By Harry A. Squires. Public Works, July, 1957.

"*Rate Making:* For Water and Sewage Services." By Albert P. Learned. Water and Sewage Works, June, 1957.

"Knowledge of *Geology and Engineering* Solves Water Problem." By Roland K. Blumberg and George A. Cushman. Public Works, July, 1957.

"The Case for *Submersible Pumps* for Deep Wells." By Roger Barron. Public Works, July, 1957.

"The Design and Construction of *Earthen Flood Banks.*" By A. Marsland. The Journal of the Institution of Water Engineers, May, 1957.

"High-Demand Restriction at Kansas City, Mo." By Melvin P. Hatcher. Journal of the American Water Works Association, June, 1957.

"Impact of Water Use for Air Conditioning on Chicago's Water System." By Hyman H. Gerstein. Journal of the American Water Works Association, June, 1957.

AUTOMATIC OPERATION of Small Water Plants

JAMES B. COCHRAN,
Divisional Manager,
Water and Waste Division,
Fischer and Porter Co.

MOST SMALL well water plants consist of one or more wells pumping into a ground storage reservoir, plus two or more booster or high service pumps delivering from the ground storage tank into the distribution system. Automatic control can be utilized with this type of plant to assure operation of all equipment under near optimum conditions and to assure a water supply even with failure of individual components.

Since the water well is pumping into a reservior, its pumping cycle can be based on the requirements of the well itself rather than directly on the demands of the distribution system. A ground storage reservoir usually has a capacity which is large in comparison with the pumping rate of the well so that a significant change in level in the reservoir will allow the well to pump for a reasonable period of time. Consequently, the well is controlled by the level in the storage tank. This level can be measured by a float, by immersion electrodes or by a sensitive pressure device. The pressure device can be a pressure switch or pressure indicator with provision for actuation of a switch or switches. Floats and immersion electrodes are not generally as desirable as sensitive pressure elements due to the possibility of mechanical binding or jamming and freezing in cold weather. It is generally inadvisable to allow the level in the ground storage tank to drop below the half full point in order to have some water available in the event of well pump failure.

If more than one well supplies the ground storage reservoir, the level sensing device or devices is so set that upon a given drop in level, well No. 1 starts pumping and continues to pump until the reservoir is full. However, if the level continues to drop even with well No. 1 running, well No. 2 will start pumping. As the level rises in the reservoir, well No. 2 stops pumping first and well No. 1 continues to pump until the ground storage tank is full. If only one well supplies the ground storage reservoir, the level controls should be set to start the well at a slightly higher level to maintain adequate storage. With more than one well, provision is usually made for manually selecting the sequence in which the wells are operated. Automatic alternation of water wells is, generally, not recommended except under special circumstances.

Another function of the ground storage level sensing device is to assure that the booster or high service pumps will not run when the level is low enough to cause them to lose suction with consequent damage to the pumps. When the level drops to the minimum safe suction pressure a switch is actuated which kills the circuit to the booster pump and sets off an alarm, such as a horn. This alarm can be silenced by means of a push button but should be of the automatic resetting type that cannot be permanently silenced by the operator. When the reservoir has filled to a safe level, automatic operation is again resumed.

Chlorination of a system utilizing well water is normally accomplished as the water flows from the well into the ground storage tank. Since, against a fixed head, a well will pump at a fixed rate of flow, automatic start-stop or semi-automatic chlorination equipment provides uniform dosage. Another, and possibly more important, reason for adding chlorine at this point is the fact that the ground storage reservoir provides the necessary contact time before the water enters the distribution system. The storage tank is kept clean and free from algae also. Where only one well pumps into the reservoir, a solenoid valve in the high pressure water supply line to the chlorinator, which opens when the well is pumping by means of an electrical interlock, makes chlorination control automatic. Where more than one well pumps into the ground storage tank, multiple or step rate control coupled with automatic start-stop operation is required. Multiple rate control is achieved by causing the chlorinator to operate at one of several pre-selected rates of chlorine feed by means of an electrical interlock with a well pump started circuit. Thus, when well No. 1 is pumping, the chlorinator feeds at one preselected rate; when well No. 2 is pumping, the chlorinator feeds at another pre-selected rate; when both wells are pumping, the chlorinator feeds at still another rate usually approximately the sum of the other two rates.

The high service or booster pumps are controlled from distribution system pressure or elevated storage tank level. If elevated storage, or some other method for maintaining pressure in the distribution system, is not provided then at least one the booster pumps must be in continuous operation. An elevated storage tank floating on the line is provided in most systems. Elevated tank level can be determined by any of the methods discussed previously, but is most commonly done by means of a pressure sensing device tied into the system at the bottom of the elevated tank riser. If the elevated tank is close to the water plant itself, pressure switches or other pressure sensitive devices which can actuate switches are used for control of the booster pumps directly. If the elevated tank is a considerable distance from the water plant, telemetering equipment of some kind is necessary to relay this information back to the control system. This is usually done by utilization of leased telephone lines.

When the overhead tank level drops below full, the first booster pump is started and it continues to operate until the tank is again full. If the demand on the system is greater than one pump can handle, the level or pressure will continue to drop and at a pre-selected point, the second booster pump will be started. This, of course, is repeated for as many pumps as there are in service at the plant. Usually the last pump to be started will be the first to be stopped as the level rises. It is possible, however, to allow all pumps started to continue running until the tank is full.

This article was based on a paper presented by Mr. Cochran at the 39th Texas Water and Sewage Works Association's Short School at Texas A & M College.

Since most water plants have a flow meter of some sort, either totalizing or rate, on the discharge line from the plant it is possible to use this instrument as a method of controlling the operation of all the booster pumps except the first one. It is necessary that the output of the flow meter first be expressed as rate of flow which can be done from either differential head or positive displacement type meters. Micro switches can be built into the flow rate recorder so that the flow exceeds the capacity of the pump or pumps running, an additional pump is started. The hydraulics of the individual system dictate whether or not this system of pump control will maintain a significantly more uniform pressure in the distribution system but, in most cases, it will since pump control is more intimately connected to system demand and it is not necessary to lose system pressure before initiating action to keep it up. Automatic control of a distribution system utilizing pressure tank rather than an elevated tank is accomplished by independent level and pressure sensing devices. The level sensing device allows the air compressor to operate when the level in the tank is high and the pressure is low.

Some method of alternation of booster pumps is very desirable. Manual alternation by means of a selector switch is quite widely used, as is completely automatic alternation. Automatic alternation is generally preferable when the pumps are closely matched.

In some instances it is desirable to have means for operation of the well pumps from the booster pump controls. For truly automatic operation, the selector mechanism which switches the well pumps to high service pump controls should actuate automatic valves to bypass the ground storage reservoir and booster pumps. In the event these automatically operated valves are not provided, this selection should be made by means of a key operated selector switch to prevent unauthorized operation.

As a safeguard, and to facilitate startup and routine testing, all pumping unit controls should have 3-position selector switches for hand-off-automatic operation. It is also desirable to have a hand-off-automatic switch for the chlorination equipment.

Adjustable time delay relays should be provided for the starting and stopping of all the pumping units. This precludes the possibility of surges causing the pump to start and to stop in rapid sequence. This is particularly undesirable in the case of the water well since frequent starting and stopping may cause the well to sand up.

The equipment for providing automatic operation of well water plants is readily available from several different manufacturers. Most of this equipment can be acquired piecemeal as each unit designed to do its particular job independently of any other control. This equipment is also available as a completely integrated control system with recording and indicating instruments built in, along with indicating and alarm lights and function selector switches. A graphic presentation of the plant itself can be provided with this type of packaged control system.

Well water plants seem to be particularly adaptable to automatic control and a fairly high percentage of them are now operated this way. This has given the operators more time to spend on other parts of their system. Since the controls themselves are simple and easily maintained, even by relatively unskilled personnel, in a few years manually operated plants will probably be quite scarce.

Can Polio Be Spread Through Back-Siphonage?

IMMEDIATELY AFTER the close of World War II, the Lincoln Air Base Hospital was converted into a housing area for married student veterans attending the University of Nebraska. The barracks were divided into 3 to 5 apartments each, with modern toilet and bath fixtures; kitchenette combined with a living room; and usually two bedrooms. Water came from the Lincoln municipal plant and sewage was discharged into the municipal sewer system. The buildings were arranged in four symmetrical rows, separated by paved streets. The ground sloped to the east, which was about 25 ft. below the west edge.

At the time of the serious polio epidemic in 1952, there were 1142 residents in this section, all students and their families. There was no filth, disorder, crowding or neglect. Between June 20 and July 27, 1952, acute poliomyelitis occurred in 27 apartments. Not a single family in Row 4 was involved and only one family in the east half of Row 3, this being a mild case. During a 5-week period more than 10 percent of the 347 children in the other 2½ rows developed polio; there was no case among the 256 children in the adjoining 1½ rows.

Chlorinated Lincoln water was brought 8 miles to the area which was fed by an 8-in. loop around the buildings with one cross connecting main. Two 8-in. sewers served the area. Toilets in the area were originally equipped with piston-type flush valves with vacuum breakers at each flush valve. However, 13 of the vacuum breakers had been removed, presumably during repairs. At 9 toilets a diaphragm type valve was installed without a vacuum breaker; at 4 toilets, the original piston valve was in place but the breaker was removed.

Water samples were taken between June 1 and Sept. 30 at the boiler plant near where the water line entered the area. Of 6 samples, 5 showed no chlorine and one a trace; bacterial counts ranged from 0 to 47. No lactose fermentation was demonstrated. This testing gave no information about the water quality in Rows, 1, 2 and 3, where polio occurred.

Hot and dry weather in early summer had created unusual drafts on the water supply; on June 12 such a dangerous depletion of the supply occurred that water use was restricted; on June 16 main breaks added to the difficulties. As a result, this area at the end of an 8-mile line, suffered erratic pressure changes, and these were aggravated by a construction program at the nearby Air Base where mains were repeatedly flushed and sterilized, intensifying the pressure fluctuations at the housing area. At times the pressure was insufficient to flush toilets; no doubt negative pressures existed at times; at other times pressure reached 125 psi, compared to a normal 35 to 40 psi.

The meager water testing program undertaken in 1952 gave little information regarding the quality of the water, principally because samples were taken at 2-week intervals and at a point which was least apt to show contamination originating in the community. It appears that the 1952 work merely established the lack of a chloride residual.

Water testing was again undertaken in 1954 and this program covered three different locations. Ten samples at the boiler plant showed zero bacterial counts; ten samples at the drug store showed four samples with bacterial numbers too great to be counted and four with counts of 10 to 80; samples taken at the rental office were erratic. No samples were ever taken in the remote portion of the loop where counts would be most likely to indicate contamination from local sources.

There is no proof that contaminated water was the cause of the outbreak and some facts indicate otherwise. For instance, the east halves of Rows 2 and 3 take water from the same stretch of main. Yet there were 9 cases among 68 children in the east half of Row 2 and only one case among 77 children in the east half of Row 3. The possibility of stratification of flow is considered by the authors, Dr. Paul H. Bancroft, MD, and W. E. Engelhard, PhD, University of Nebraska, and K. E. Copeman, Inspector of Plumbing, Lincoln Water Department, who presented a paper before the 50th annual meeting of the American Society of Sanitary Engineering, held in Chicago in 1956. This article is an abstract of the paper, which is much more detailed and complete.

Conclusions of the authors were: (1) Chance distribution of the cases is an unlikely explanation; (2) there is good reason to conclude there was fecal pollution of the water; and (3) no other sociologic or environmental factor shows any correlation with the distribution of cases.

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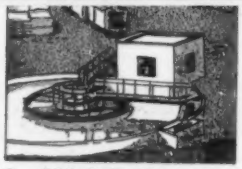
Public Relations Pay Off in Water Works

The Los Angeles Department of Water and Power was awarded a Certificate of Outstanding Public Relations Achievement in the utilities classification of the annual national competition of the American Public Relations Association. Samuel L. Friedman, director of public relations for the city-owned utility, accepted the award for the Department of Water and Power's entry, "Person-To-Person Public Relations Eases a Giant Water Line Through the Heart of Hollywood."

The actual program was in operation for a period of several years during the installation of a 6-foot diameter water conduit which carries 171 mgd. Knowing the peace and quiet of a community are disrupted by an invasion of men and machines that tear open deep trenches and start moving in sections of pipe large enough for a man to walk through, the public relations program was the difference between what might have been angry public criticism and what did eventualize into general public patience.

In carrying out the plan, the Public Relations Division of the Department of Water and Power had the full cooperation of management, the personnel of the Water System, and contractors' men on the job, making it a team effort in public relations.

A large, bound volume of the program's aims, methods and results, together with printed materials used, letters and other forms of contact with each resident along the route; educational work with schools, churches, business establishments, movie studios, and other organizations; steps taken to reduce interference with traffic and with normal community activities were outlined; and other "person-to-person" public relations activities, together with the record of favorable public responses constituted the Department of Water and Power's entry.



PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Paper Mill Waste Treatment

In 1948 when the first major step was taken by the Kingsport Division, a paper mill operated by the Mead Corporation at Kingsport, Tenn., to reduce the suspended solids load being discharged to the South Holston River, the plant waste effluent carried a suspended solids content of 250,000 lb. per day. A kiln was installed to recover lime from the mud in the effluent, resulting in reduction of 120,000 lb. per day in suspended solids. A furnace was installed to effect complete combustion of the char from the recovery of soda ash from the black liquor, and a lagoon was constructed to pond the fly ash effluent from the lime kiln. These coupled with the installation of a "broke washer" reduced the suspended solids in the waste effluent to around 70,000 lb. per day. BOD in the effluent was reduced by various improvements in plant production facilities, about 27 percent from 1951 figures. Experiments with activated sludge treatment indicate that at peak efficiency, 98 percent BOD reduction could be obtained with 96.5 lb. of BOD removed per 1000 cu. ft. of aerator volume. Present indications are that the broke-washer effluent can be treated by clarification followed by activated sludge treatment, and that the sludge resulting can be given anaerobic digestion.

"Stream Improvement Program for a Paper Mill." By John K. Sullins, Kingsport Division of the Mead Corp. *Sewage and Industrial Wastes*, June, 1957.

Refinery Waste Toxicity Studies

As a part of a study to determine the total effects of oil refinery pollution of waters of Oklahoma, the toxicity to *Gambusia affinis* of the individual chemicals that might appear in the wastes was determined. The effects of turbidity were also noted, and the ability of the various compounds to precipitate turbidity was studied. Water from turbid ponds was selected for dilution and was dumped immediately after collection into the test aquaria. Ten fishes were used in each aquarium including a control aquarium. Experiments were continued for at least 96 hours with checks for survivors made at 24-hour intervals. Dilutions were based on the progressive bisection of intervals on a logarithmic scale, and a median tolerance limit was plotted on logarithmic paper when lethal concentrations were included within an experimental range. The temperature, turbidity and pH of the experimental waters were measured after the chemicals were added and daily thereafter. Data were collected on the toxicity of 86 pure chemicals and these are listed in tabular form in the article, as are the data on turbidity toxicity. The appendix of the article contains a summary of the experimental data on each chemical. A total of 29 potential compounds of refinery waste were found which precipitate turbidity.

"Toxicity to *Gambusia Affinis* of Certain Pure Chemicals in Turbid Waters." By I. E. Wallen, W. C. Greer, and R. Lasater, Oklahoma A & M College. *Sewage and Industrial Wastes*, June, 1957.

States' Preparedness and Radioactive Wastes

As the development of atomic energy use shifts from a defense activity to "atoms for peace" activity, there is an agency responsibility shift from federal to private industry, which will place an increasing burden on state government for surveillance and control. New factors which must be considered in utilizing water courses for radioactive waste disposal are that the wastes may demand a million times the dilution water required to nullify other pollution characteristics; that the food chain in streams

Plastic Waterstop Aids Sewer Expansion Program

INDUSTRIAL building expansion south of Milwaukee has required corresponding provisions for sewage collection and disposal. Consequently, a network of new sewers is being developed by the Milwaukee Sewage Commission in this area, and as a part of this work the R. W. Construction Company is constructing a special section of sewer one mile long leading to the Jones Island Filtration Plant.

The sewer is 39 ins. by 30 ins., elliptical section. Specifications required the pipe to be laid 25 feet below the ground. However, the soil in this particular neighborhood consists of heavily watered sandy gravel from 12 to 25 feet down, and digging the trench turned out to be a difficult task. Shoring was a big problem, and pumps had to be operated around the clock to keep the trench dry enough to work in. Because of the presence of so much water, special precautions had to be taken to prevent seepage through the construction joints. To secure this protection, the engineers specified polyvinyl plastic waterstops for all joints. Water Seals' Labyrinth Flextrip Waterstop was used. This forms a secure bond between pours and resists the passage of any water; also it is resistant to chemical and corrosive action, assuring a long life for the structure.

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becomes affected; that thermal and density conditions require more specific study of factors affecting stream flow patterns; that the hazardous characteristics of a waste may be carried undiminished throughout the length of the stream; that radioactivity is removed from solution by certain sediments, transferring the problem to the stream bed. The dissolved minerals in a water supply for a nuclear energy plant are significant, offering a means of control. Knowledge of background radioactivity in an area subject to radioactive pollution is important and requires an immense amount of work. Very limited areas of the sea are suitable for sea burial of wastes. More information must be acquired in connection with this practice. The time element of hundreds and thousands of years for decay to take place must be considered in ground disposal of wastes. The results of an inquiry sent to the states indicate little activity to assume responsibility. It is recognized, however, that the biggest deterrent to establishment of control resources in the states has been the rapid development and complexity of the problem and the requirement for special training. Budgets, as usual, are a factor.

"Radioactive Waste Problems Facing State Governments." By E. C. Jensen, E. F. Eldridge, C. M. Everts, Jr., and H. C. Clare. *Sewage and Industrial Wastes*, June, 1957.

Automatic Atmospheric Ozone Recorder

By 1954, it was evident that the Los Angeles smog contained more than the normal clean air concentrations of ozone, and there was a need to make the ozone-oxidant relation quantitative over the full range of oxidant values reached in smog attacks. A continuous recording ozone photoelectric-spectrometer was constructed, consisting, of a projection unit utilizing a CH3 high pressure mercury lamp, and a receiving unit composed of the prism spectrometer, the photomultiplier detector and associated electronics, and a strip-chart recorder. Absorption by ozone of ultraviolet radiation in the region of 250 to 300mμ is used as a basis for measurement of concentrations between 0 and 100 parts per hundred million. Nighttime values which do not exceed 2 or 3 p.p.h.m. furnish a basis for instrument calibration. Values up to 35 p.p.h.m. were obtained during August, 1955. The optical path was approximately 300 ft.

"Automatic Long-Path Ultraviolet Spectrometer for Determination of Ozone in the Atmosphere." By N. A. Renzetti, Air Pollution Foundation. *Analytical Chemistry*, June, 1957.

Nerve Gas Detection

Colorimetric and fluorescent reactions for the detection of nerve gases have been used for monitoring of the atmosphere, but they have the disadvantage that sources of visible or ultraviolet light are required to illuminate the sample. The discovery that chemiluminescence is produced by treatment of a luminol solution with hydrogen peroxide and potassium ferricyanide, led to a study of the possibility of using the reaction for detection purposes. Nerve gases such as sarin produce the chemiluminescence in place of the potassium ferricyanide. An Aminco microphotometer was used to evaluate measurement possibilities. Portions of 0.5 ml of nerve gas solutions in isopropyl alcohol were added to 2.5 ml of a luminol-perborate solution. A transient blue-green luminescence was formed which reached peak intensity in 15 seconds and persisted for about 2 minutes. The maximum photometer reading plotted against nerve gas concentration produced a reasonably straight line, indicating that the reaction may also be used for quantitative purposes.

"Detection of Nerve Gases by Chemiluminescence." By Jerome Goldenson, Chemical Corps, Chemical Warfare Laboratories. *Analytical Chemistry*, June, 1957.

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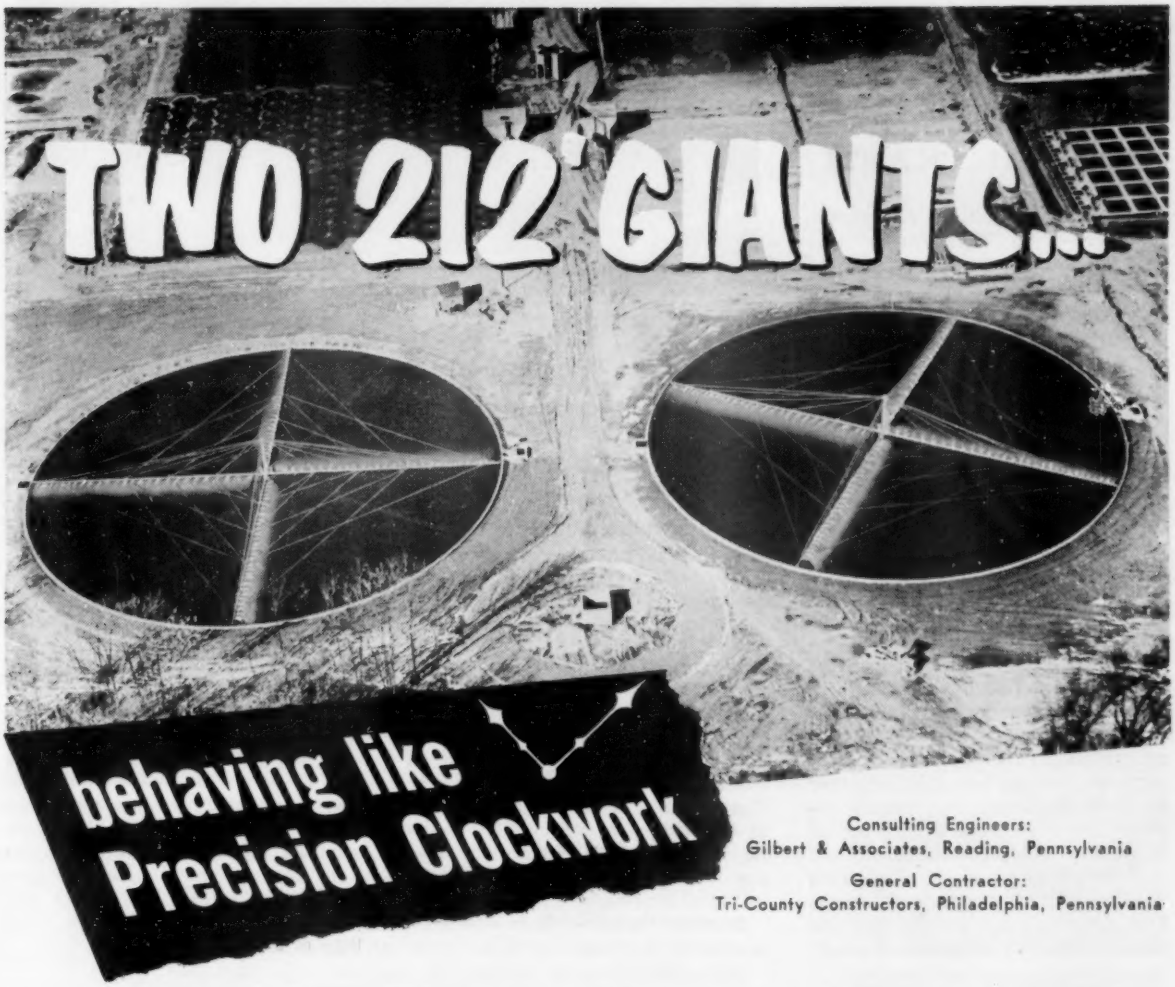
Scientific Study of Passenger-Car Accidents

The New York State Thruway Authority is cooperating in a year-long survey with the State Health Department, the State Research and Testing Center, the New York State Medical Society and Cornell University Crash-Injury Center. Researchers will concentrate their studies on the drivers of the vehicles and the cars themselves.

The controlled-access features of the Thruway, with the toll tickets and the close around-the-clock State Police supervision of traffic, make it possible to obtain mileage exposure data, including traffic volume, weather and road conditions, length of time a driver has been traveling on the Thruway, and similar information. The Police will also take special photographs to show structural damage to the vehicles involved.



Consulting Engineers:
Gilbert & Associates, Reading, Pennsylvania

General Contractor:
Tri-County Constructors, Philadelphia, Pennsylvania

Two Huge Carter Rotary Distributors at Reading, Pa. Sewage Treatment Plant Have Capacity of More Than 9,000,000 GPD

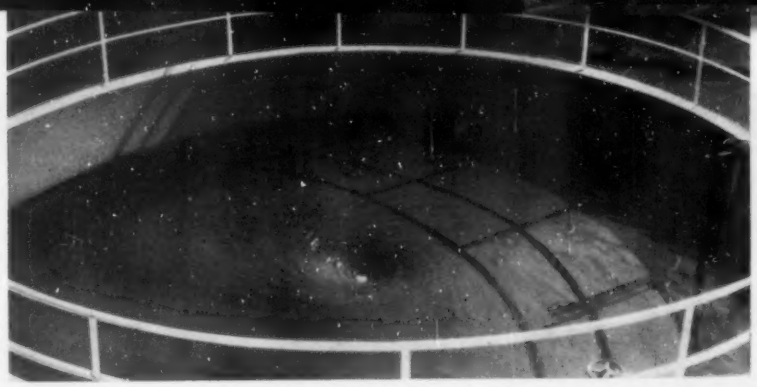
Design and manufacture are put to a true test of skill and accuracy in creating 212′ giants such as the two Carter Rotary Distributors at the Reading, Pa., Sewage Treatment Plant. Designed to handle 3200 GPM each, these rugged high capacity mechanisms reflect all the precision and smooth operating characteristics of much smaller units, with their easy, perfectly balanced rotation and well aerated, film-like sprays distributed uniformly over bed areas.

Carter Rotary Distributors are available in sizes and arrangements adaptable to any form of trickling filtration, for both high rate and standard rate designs. Every unit, large or small, receives the same careful engineering and precise manufacture, assuring maximum trickling filtration effectiveness through perfect distribution of effluent over filter beds.

Write Today for Free Bulletin 5210

RALPH B. CARTER COMPANY
210 ATLANTIC STREET, HACKENSACK, NEW JERSEY

WASTE TREATMENT PROCESS FOR SMALL PLANTS



● SPIRALING action of mixed liquor at vortex is shown in view of 30-ft. tank.

DORR-OLIVER has developed the Dorr-Oliver SpiroVortex System for the complete treatment of domestic sewage and intermediate treatment of industrial wastes. This newly developed treatment method operates on the same principle as the activated sludge process and is stated to produce a treated effluent from which over 90 percent of the BOD in the raw sewage has been removed. Although particularly applicable to new plants treating one mgd or less, the method may be advantageously employed in the expansion of existing plants in which it is feasible to divide the flow to the secondary treatment stage.

In the SpiroVortex System, secondary treatment comprises aeration on a filter bed and two periods of contact time prior to secondary clarification plus extremely high recirculation rates. Operating power requirements are less than for other methods producing comparable results. The system has been installed in six new treatment plants.

Flowsheet of a typical SpiroVortex System follows conventional practice in the primary clarification and sludge digestion steps. First phase of secondary treatment, however, is mixing of primary clarifier overflow with secondary clarifier sludge and Superate filter effluent in the primary SpiroVortex tank. Feed, introduced to the tank tangentially, spirals toward the center and is removed from the central vortex. It is then combined with part of the flow from the secondary SpiroVortex tank and pumped to the Superate filter for aeration.

Distribution over the shallow rock filter bed is accomplished using a high-capacity rotary distributor. Filter effluent is split, with controlled flows fed tangentially to each of the SpiroVortex tanks. After additional contact time in the secondary SpiroVortex tank, mixed liquor removed at the vortex is recirculated to the Superate filter. Recirculation rates are determined by the BOD strength of the raw sewage.

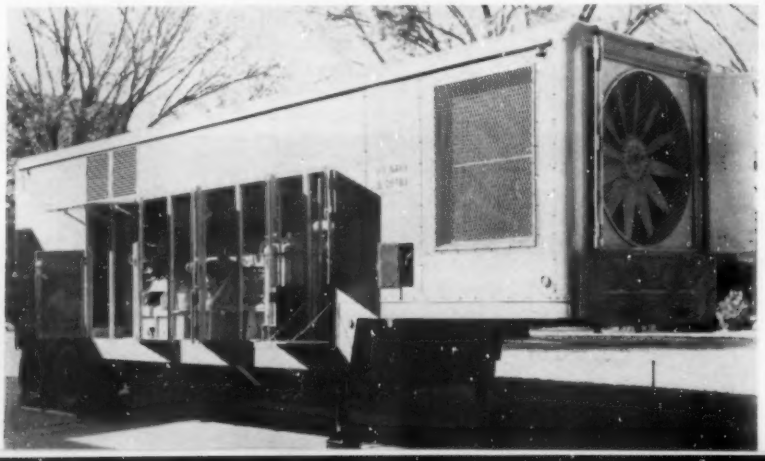
Part of the flow from the secondary SpiroVortex tank becomes treated effluent after settlement in the secondary clarifier. Underflow sludge from this unit is returned to the primary clarifier or recirculated to the primary SpiroVortex tank.

In addition to low operating costs, high degree of treatment, and adaptability to either new or expanded small treatment plants, Dorr-Oliver says the SpiroVortex System will produce a sludge with excellent settling qualities. High recirculation rates increase ability to cope with sudden loads and changes in raw sewage characteristics. The recirculation rates are far greater than those employed in the Biofiltration type of treatment. However, this new system will produce a higher degree of purification than treatment using conventional or high rate trickling filters. Operating results from the six installations to date indicate that excellent BOD removals are accomplished by this type of treatment.

Fairbanks-Morse Builds Trailer Diesel Plants

A TRAILER-MOUNTED diesel generating plant has been built by Fairbanks, Morse & Co. Rated at 675 kw for continuous, heavy-duty service, this plant meets size and weight requirements for over-the-highway movement. It is 36 ft. long, 8 ft. wide, 12½ ft. high and weighs 72,000 pounds. The trailer includes a six-cylinder opposed-piston diesel rated at 962-hp; generator, switch-gear and control equipment; complete cooling, lubricating and fuel systems; starting air compressor; and auxiliary engine. Also included is a 450-gallon fuel tank, sufficient to run at full load for 9 hours.

● THE NAVY'S new F-M mobile diesel plant is ready to deliver 675 kilowatts.

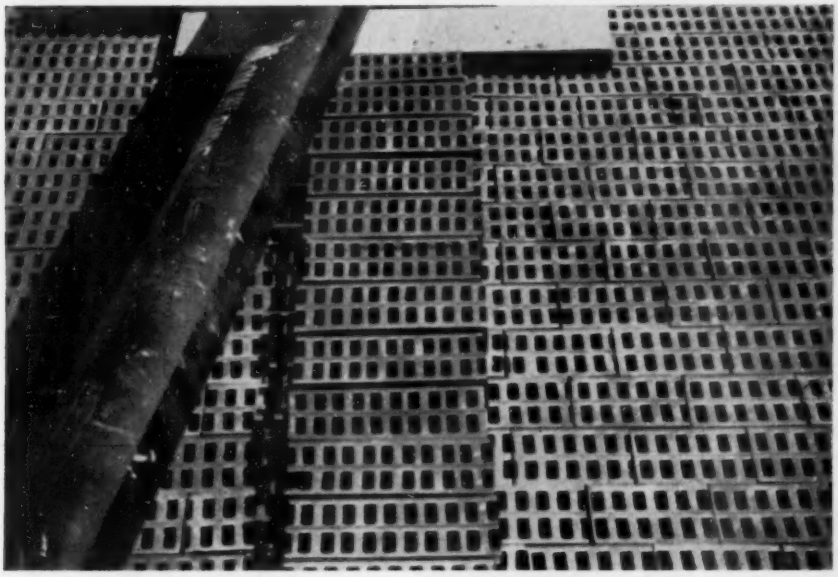


In addition to the 675-kw plant, Fairbanks-Morse has three smaller trailer-mounted generating stations, rated at 350 kw, 400 kw and 500 kw. The 500-kw unit has a 750-hp, 10-cyl. diesel and weighs 51,500 pounds; the 400-kw plant, with 600-hp engine, weighs 47,500 pounds; and the 350-kw unit, with a 525-hp diesel weighs 45,100 pounds. Using only the built-in fuel supply, these diesels can run at full load for 12.2 to 16.1 hours.

Starting air is stored in tanks with enough capacity for three starts. A 6 kilowatt diesel-generator set supplies energy for the compressor, lighting and other auxiliaries when the main engine is shut down. The small generator set is started by a 24-volt battery.

First of the new mobile power stations was delivered to the Navy's Bureau of Yards and Docks, providing an emergency power source for established yards and bases and an immediate power supply for any construction site or isolated installation.

Greatest Improvement in Trickling Filter Design...

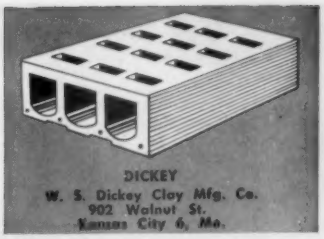


Orient (Ohio) State Institute trickling filter with TFFI Specifications underdrain blocks. Engineers, Uhlmann & Associates; Contractor, E. P. Coady & Co., both Columbus, O.

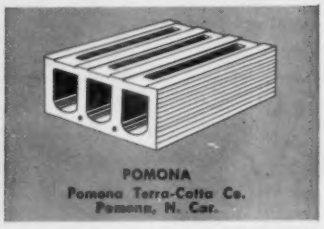
TFFI vitrified clay underdrain blocks are the greatest improvement yet introduced into trickling filter design. All consulting engineers should specify them. They provide maximum drainage and ventilation capacity. They are strong, durable, corrosion-resistant and easy to handle or lay.

Other Important Advantages

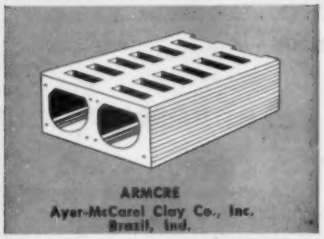
Other important reasons for choosing trickling filters with TFFI blocks in *any* plant are: Simple, easy operation; long life—longer than the bonds issued to pay for plant; overload is no problem — take temporary and shock loads in stride. Also, good results: top-notch effluent, day in and day out; ease of expansion, trickling filters, properly designed, are easy to expand to meet future increases in population or loading. And adaptability to handle industrial wastes and domestic sewage, separately or combined.



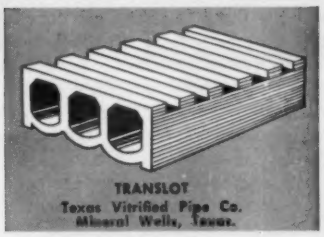
DICKEY
W. S. Dickey Clay Mfg. Co.
902 Walnut St.
Kansas City 6, Mo.



POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



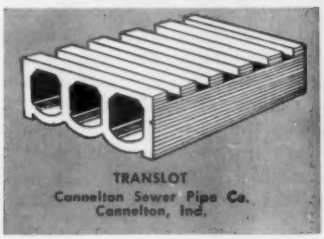
ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas.

BOSCO
Bowerston Shale Co.
Bowerston, Ohio

NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.

TFFI

Symbol of
good treatment

TRICKLING FILTER FLOOR INSTITUTE

Designing engineers may address any manufacturer member listed in panel at right for HANDBOOK OF TRICKLING FILTER DESIGN—free.

● ONE of three Drott Bullclams used for landfill by Davidson County, Tennessee.

Tennessee County Uses Sanitary Fill

THE CITY OF Nashville, Tenn., has its own garbage disposal system, but the 150,000 persons residing in surrounding Davidson County outside the city limits are served by the county refuse disposal system.

Ten years ago, the county turned to the sanitary landfill method of garbage disposal, using crawlers and bucket loaders. At present the County Health Department, which owns the units used in their garbage disposal system, works three International Drott TD-14 Bullclams on the five landfill sites now in operation. A total of 125 privately-owned trucks haul what is estimated to be an average of 3,500 cu. yds. of refuse daily to the five landfill sites.

Dirt on top of the near-surface rock is a real problem in this county. Hence, each day's refuse is covered with an average of 3 in. of dirt. The finished grading is done with a 2-ft. seal coat.

County Wide Water Study

(*Continued from page* 114)

and 121.8 in the near future. The aggregate average daily water requirements, which during the year 1955 were 66.4 million gallons per day, are expected to reach 124 million gallons per day when the County reaches substantially a saturation development.

Certain of the County's public water systems rely wholly upon local wells for their supply and therefore must have well pumping capacity two or three times that needed normally in order to meet maximum daily requirements and provide a reserve for outages.

An over-all comparison of the total water supply capacities, including wells and other developments now definitely planned, with the probable future water requirements are shown in Table 1, page 114.

For the year 2000, the estimated excess of water requirements over available capacity of 12.2 million gallons per day would be indicative of the magnitude of the additional water supply required to be developed in the future, only if all of the water systems of the County were completely interconnected and the sources of supply operated as a coordinated unit in the most efficient manner to serve peak loads and obtain the maximum dependable yield of the sources. It would be unsafe to reply upon achieving such complete pooling of resources, however.

In the eastern portion of the County, the Hackensack Water Company will have sufficient developed capacity to meet the needs of the area served by it until about 1972. Thereafter, it is estimated that the Company will have to develop an additional 24 million gallons per day to meet ultimate requirements. The above comparisons exclude any receipts of water from the Passaic Valley Water Commission and Jersey City, which under present contracts may average ten million gallons per day. The Park Ridge system, operating as a self-sufficient system, will require additional well pumping capacity to meet maximum daily demands which by the year 2000 will total four million gallons per day.

In the northwestern portion of the County, the average annual daily and maximum daily requirements for the year 2000 are estimated at 18.0 and 43.2 million gallons, respectively. Existing and proposed wells will have a dependable capacity of 26 million gallons per day without interconnection but in this area two systems now need additional well capacity to meet present peak loads. With each system operating independently, a total of 17.0 million gallons per day of additional well capacity will be required to meet maximum daily demands in the year 2000. Interconnection of systems and interchange of water as required to meet maximum daily demands would render existing wells capable of meeting requirements for about ten years. Thereafter, additional supplies would be required to meet peak demands unless storage on an impounded surface supply were available.

The systems in the west central portion of the County are interconnected with the systems of the Passaic Valley Water Commission and the Hackensack Water Company and generally interchange water to the extent required to meet peak demands. The estimated ultimate requirements of the systems of 21.21 million gallons per day can be supplied from the 12.1 million gallons per day now available from wells, supplemented by water from the surface supplies as at present. The Passaic Valley Water Commission furnished an average of 9.95 million gallons per day in 1955.

The two systems in the southwestern portion of the County obtain their supply from Jersey City. Present and ultimate average daily requirements are estimated at 2.7 and 3.8 million gallons per day. Their future needs can be met readily by the present supplier.

In order adequately to provide for the future water needs of Bergen County, it is the judgment of the Committee that about 50 million gallons per day of the County's undeveloped potential water resources should be reserved for development, when and to the extent required by future growth in requirements.

Local vs. Regional Developments

The water resources of a drainage basin constitute the normal and logical source of water supply for the persons residing therein. Residents within a watershed properly look to and have special rights in

the surface and ground waters of the basin, without relation to political boundaries. The local resources generally will be more economical to construct and operate than large remote developments. In the allocation of the water resources, future local needs should be protected in connection with diversions to serve more distant localities.

The economy of development of local sources is exemplified by the expansions planned by the Passaic Valley Water Commission and Jersey City. According to the report by Tippetts - Abbett - McCarthy-Stratton, the estimated cost of the Passaic Valley Water Commission's Point View project, which will add 55 million gallons per day of dependable capacity is $10,000,000 equivalent to $181,800 per million gallons per day of added yield. Jersey City's Longwood Valley project similarly is estimated at $239,-700 per million gallons per day of added dependable yield.

Local wells can be developed at costs ranging from $50,000 to $200,-000 per million gallons per day, depending on the yield per well and the extent of the preliminary exploratory drilling done. In general, rock well developments will range in cost between $150,000 and $200,-000 per million gallons.

A number of studies have been made in the past of various alternative methods of developing the Ramapo River for water supply. All have shown it to be highly economical for supplying Bergen County. Reliable, present-day estimates of the cost of projects utilizing the waters of the Ramapo or Saddle River would require detailed surveys, borings and preliminary designs, which are beyond the scope of this study. The Committee is of the opinion, however, that the cost of developing the Ramapo River, exclusive of purification and transmission facilities, would be less than $200,000 per million gallons per day of yield, exclusive of water rights, if any.

For many years, proposals have been made for the development of a large State project to provide for the long-range requirements of the entire northeastern portion of New Jersey. The water systems of Bergen County must continue to plan and develop their own supplies as reliance on the availability of water from a future State project would be speculative. Regardless of this, however, such large projects appear to offer little advantage to Bergen County. The County is in a favorable position with relation to local

supplies and is remote from any proposed State development.

The recent report to the State prepared by Tippetts-Abbett-McCarthy-Stratton recommended the development of 70 million gallons per day by the construction of the Chimney Rock project. Its cost was estimated at $29,470,000 ($421,000 per million gallons per day), exclusive of purification plant and transmission mains. Pipe lines to bring the water from Bound Brook to Newark were estimated at $23,680,000 ($338,200 per million gallons per day). Additional cost would be involved to bring the water into local systems for distribution.

The Round Valley project also has been proposed and money made available by the State for purchase of the necessary reservoir lands. However, its estimated cost, according to the report of Tippetts-Abbett-McCarthy-Stratton, exceeds that of Chimney Rock and it is even more remote from Bergen County.

Recommendations

Based on its study and analysis of the present and probable future water supply situations in Bergen County, the Committee recommends:

(a) That the water systems of the County study and arrange for efficient use of present water supplies, prevention of deficiencies and the gaining of the economies associated therewith.

(b) That individual water systems evaluate in detail their distribution and storage facilities to provide for peak flow demands.

(c) That control of the diversion of ground water, through the delineation of Bergen County as a protected area by the State, be sought in order to avoid unessential use and waste of this valuable resource.

(d) That effective cooperation of state and local health agencies and water works officials be sought to protect the County's rivers and underground waters from pollution by domestic or trade wastes.

(e) That a study of the groundwater resources of the County be made under a cooperative agreement between the United States Geological Survey and Bergen County.

(f) That every effort be made to preserve and protect the waters of the Ramapo River and other local water resources for the required future use of Bergen County.

(g) That lands essential for the construction of dams and reservoirs be protected against appropriation for other purposes which might preclude their later use for water supply.

• • •

BLOCKING WATER PIPE FITTINGS

(Text and illustration courtesy Cast Iron Pipe News)

ALL WATER PIPE fittings should be blocked or tied to prevent end thrust. Often this simple rule of good water works construction is overlooked or omitted.

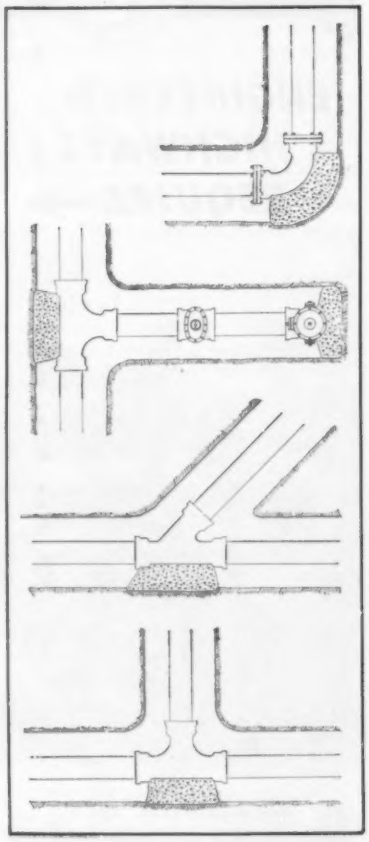
Most water pipe lines are designed for 150 pounds working pressure and to these should be added a reasonable amount for the water hammer experience of that community. In general, water hammer allowances range from 70 pounds to 120 pounds, with the larger allowance being for the smaller diameter mains.

The principle of blocking fittings applies to the following types of joints: Bell and spigot joints (lead, cement, or sulphur compound), mechanical joints, roll-on joints, and to the newer type of rubber ring joints.

All of these joints have great resistance to leakage or pulling apart when laid in a straight line of pipe; but whenever a change of direction is created, or when fittings serve as dead ends, such as tees and fire hydrants, then support should be provided in the form of thrust blocks or tie rods to withstand the pull-out load.

Every water superintendent can call to mind various bell and spigot joints that were not backed up or secured, but which did not fail. However, this does not prevent these joints from pulling apart at some future time when it is least expected and when it will be difficult to make repairs. If the soils are soft and marshy, then tie rods should be used in place of blocking. Normal clay soils will afford a safe bearing load of about 2000 pounds per square foot. The area of the blocking material should be large enough to withstand the water pressure plus water hammer.

Drawings illustrate correct blocking procedures.



● **PROPER blocking withstands end thrust where lines change direction.**

Diversified Approach Solves Water Problems

(Continued from page 131)

mains, as well as a second standpipe, will be required. However, these have been programmed for future installation to coincide with the area's residential growth.

Peabody System

The improvements initiated for Peabody system proper were, of course, much more extensive. The program included a connection to the MDC system; increasing the storage capacity of Spring Pond; the addition of several arteries to the distribution system; installation of a one-million gallon standpipe for distribution storage; installation of an automatic pump at the main pumping station; and increasing the storage capacity of the existing distribution reservoir.

The distribution pipe network has been improved by the installation of a new 16-in. pipe which was designed to increase pressures and fire flows in the area west of Peabody Square. Other important 6-in., 8-in., 10-in. and 12-in. mains will be installed during the second step of the program to eliminate existing dead ends, as well as to improve fire flow requirements and pressure at the industrial and shopping centers.

The excavation contract, now under way, will eliminate many of the shallow areas at Spring Pond. It is expected that the quality of the water will be improved by this operation, and also the storage capacity of the pond will be increased, which in turn will increase its yield.

Ten feet will be added to the height of the existing distribution reservoir, increasing its storage capacity from about 3 mg to about 5 mg and also raising the pressure in the system about 4 lbs. for better service in areas of high elevation. The existing reservoir is circular stone masonry, and the 10 feet will be added either by means of steel plate securely bolted to a watertight mastic at the top of the masonry wall or by adding a prestressed 10-ft. concrete section. The new million-gallon reservoir and the distribution reservoir will have their overflows at the same elevation after the 10 feet are added.

A new automatic pump to supplement the existing units, will have 2000-gpm capacity and will be designed to operate by telemeter control from the masonry reservoir. The pump will be operated only during nights and week-ends to maintain proper water level in the reservoir.

A deficiency in the yield of the City's water supply system due to unusual demands will be eliminated by connecting to the MDC system. A 24-in. connection nearly 12,000 feet long will supply Metropolitan water to Peabody at pressures adequate to negate repumping cycles. MDC water will be used only during periods when the present supply system is inadequate. Normally, about half of this 24-in. pipe will not be in use; however, the balance of the pipe will become part of the distribution system eliminating some fire flow inadequacies in South Peabody.

This is the Peabody story. As previously mentioned, there is nothing radically different about any of the equipment, nor is there anything unusual about any of the individual steps in the program. Actually, from the technical standpoint, the system represents nothing radically new. It is interesting, however, because it did and does represent a water supply and distribution problem that was solved by a number of diversified—yet unified—steps. But collectively, these integrated steps added up to a very satisfactory whole, at least in Peabody's case. Perhaps they might also provide a solution for other communities with a similar problem.

Measurement of Engineeering Production

(*Continued from page* 116)

It should be pointed out that while the design activity within an engineering organization represents a major share of the work being performed, there are other activities that fall almost wholly within the realm of service or routine functions, ie., contract preparation, record keeping, map making, report writing, plan checking, and normal administrative functions.

Application Of Production Index Unit Plan

Utilizing our theoretical figure of 73 percent of the work performed in a design squad as measurable and 100 percent of other usual functions within an engineering organization also measurable, we now turn toward the principles of measurement as advocated in scientific office management.

Harry L. Wylie, Assistant Secretary-Treasurer of the Pure Oil Company, also lecturer at Northwestern University, and Robert P. Brecht, Ph. D., professor at University of Pennsylvania and Past President of National Office Management Association, advance the Production Index Unit Plan of measurement in their book, Office Organization and Management.

A production index unit is any unit of work which can be used as an indicator for reflecting composite variations in a large number of operations. Because work in the various departments or units of large enterprises is related, springing basically from a few routines which affect, sooner or later, the bulk of office activities, it is possible to measure the work done on these routines and use it as the basis for an index computation.[2]

Mr. Wylie and Mr. Brecht further state that, whatever routine or routines are selected, they should represent at least 70 percent of the total activity in order to be sensitive enough to measure the variations in the office unit, to be significant over a long period of time.

These production units can be related to either man-hours, total office cost, or total labor cost, and therefore able to be utilized in either a cost accounting or a work measurement system.[3]

Conclusions

These principles of measurement as outlined indicate that scientific management can be utilized within an engineering organization in the same basic means as employed in any office production unit. Certainly it can be said that drafting and other service tasks are a measurable activity. It then remains the job of the analyst or supervisor to isolate these tasks and measure their production to obtain the required production measurement of the entire organization. There can be no disputing the fact that the design function depends upon the service function to produce the desired product of engineering plans. The engineer cannot create faster than the plans can be drafted or the creative function advances beyond its use ability. The problem can be narrowed down to—how to isolate the service functions?

A method of establishing scientific office management. Many books and articles on systems procedures and systems analyses have been written, each outlining basic steps in organizing and establishing scientific office management routines and techniques. One such system as published in "Office Management" lists the following steps:

1. Determine clerical (routine) departments in an office.
2. List basic repetitive jobs within each department.
3. Determine basis of measure for each job.
4. Have individual workers report the hours worked on each job but not their individual production on each job.
5. Use as a counting point within the department (group) report the total units processed on each job.
6. From these two basic counts—workers individual time on each job and group total output on each job—a standard would be established for each job.
7. Actual work measurement program would begin with total department hours spent on each job recorded each week, as against the number of hours the department should have taken according to the standard to process the amount of work.
8. A running comparison of each department (group) performance with the performance of all other departments in the office (doing the same work) would be kept to show management the weak spots.[4]

Reasons for measuring the engineering function in Government. Many persons may ask—Why is it necessary to attempt to measure these engineering functions? We are nationally engaged in the larg-

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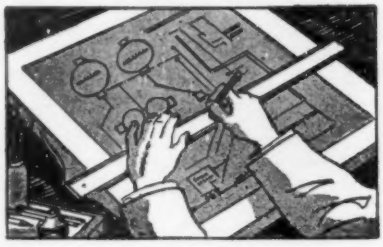

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est road building program in the history of our country. Couple this with the construction of homes, sewers and water works buildings and we are faced with a severe shortage of civil engineer personnel. This shortage is not of a temporary nature but is expected to increase for at least the next five years. Standards of work measurement can be expected to serve at least five purposes:

1. Provide an accurate measuring stick for personnel requirements.
2. Make budgeting and forecasting of payroll and unit costs more accurate.
3. Provide a control of production costs.
4. Provide a basis for training needs for operating personnel and supervisors.
5. Provide accurate data for public relations criteria.

Actually the question is not why is it necessary to measure engineering functions, but rather, how *quickly* can we organize to provide the basis and means of measuring engineering production?

The application of scientific office management is recommended as one of the ways to accomplish this vital necessity and still conform to both performance budgeting requirements and professional engineering integrity.

Future developments. Many engineering agencies, including the State of California Department of Highways and the City of Los Angeles, have already utilized electronic computing machines for the routine functions requiring mathematical calculations. It seems only a question of time before these same machines will be utilized for the administration process of planning and control. Some method of production evaluation is a prime necessity before concrete decisions based upon accumulated data can be realized. The most difficult job is to organize and simplify the tasks in routine procedures for measurement. As with other past developments, simultaneous programs will blossom from progressive agencies to lead the field for other branches of government. In the meantime, each supervisor and analyst in an engineering organization should be cognizant of these methods of determining engineering production and control as another means to produce the desired output of better designed engineering plans with fewer professional engineers. We must recognize the necessity of separating the creative tasks from the service operations so that we may

correctly utilize all of the professional engineering talent available.

Many articles have been written concerning the inadequate salaries being paid to professional engineers in comparison with other professions such as doctors or lawyers. Management has often stated that the function of engineering in being merely a part of the production of plans has caused the holding back of the recognition of the creative requirements of the professional engineer. Let us separate the service functions and elevate the engineer to the rank deserved on the top rungs of the ladder of professional positions.

References

1. Committee on Basic Accounting and Cost Control Procedures, *Construction Cost Control*, ASCE, 1951, New York.
2. Wylie, Harry L., and Robert P. Brecht, *Office Organization and Management*, p. 64.
3. *Ibid.*, p. 65.
4. Fairbanks, Ralph W., "How to Establish a Clerical Work Measurement Program", *Office Management*, Vol. XVI No. 5, pp. 19-20.

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Highway Planning

(*Continued from page* 129)

future traffic needs, and will be backed up by facts. Where O&D data in conjunction with volume forecasts show that a new route will be required to meet the traffic needs, the engineer will be concerned with a highway location problem, including alinement and grade, drainage, right-of-way damage, etc.

The most difficult part of the small-town engineer's highway planning program lies ahead. The engineer may do a most thorough and competent job, worthy of having a monument struck off in the public square, but all the professional competence in the world goes to waste if it can not be translated into action. Just as most American cities were not designed for the overwhelming volumes of traffic now crowding through the streets, so most American people are not mentally geared to follow through the technical details of a complex highway planning study.

The engineer therefore must turn his hat around and become a public relations specialist and salesman extraordinary. Nation-wide experience has shown that opposition to downtown bypasses mainly comes from these two groups:

1—Businessmen who mistakenly think that traffic which is

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jammed up in the streets in front of their stores means dollars in the cash registers.

2—Taxpayers who hate to spend money, even as you and I.

Since the best defense is a good attack, the engineer should have on hand several copies of the bulletin distributed by the Chamber of Commerce of the United States. These are entitled "How Bypasses Affect Business"; they may be obtained for 50 cents per copy by writing to Chamber of Commerce of the United States, Washington 6, D. C. Because this is an official publication of an organization devoted to the interests of businessmen all over the country, it will carry more weight than the engineer's most persuasive arguments about the benefits of a bypass.

The same publication will help to answer taxpayers' objections to a new highway bond issue. The long-term advantages of traffic relief can be shown, from case histories in the U. S. Chamber of Commerce bulletin as dollars and cents tax relief due to increased land valuations. Frankness pays. It should be pointed out that for the first five years, perhaps, the tax base will be smaller due to the loss of ratables.

Usually there are a number of forward-looking members of the local Chamber of Commerce who will carry the ball in the highway improvement program. An adequate number of reports should be prepared at a 9″x12″ size, with a little explanatory text for each exhibit, and a clear statement of the problem, a detailed description of the plan, and an explanation of the benefits of the plan, traffic-wise and community-wise.

It will help considerably to prepare one or more additional plates for reduction to a 9″x12″ size to illustrate the benefits of the plan. A peak-hour plate showing the redistribution of traffic after the plan is completed would be especially useful, since it graphically points out the reduction of traffic on the problem route. If the improvement consists only of widening or elimination of parking, the improvement will show up as extra traffic capacity to accommodate the traffic and relieve the deficiencies. Other plates, such as the relation of the planned arterial highway to the basic planning features are helpful, but not so essential as the peak-hour plate.

If the engineer has planned wisely and talked well, he may one day be able to leave his office at 5 o'clock, when traffic is heaviest, and be home at 5:05.

PUBLIC WORKS
EQUIPMENT NEWS

Special Equipment Ready For Willys FC-150

Either a dump truck body or service truck body may be installed on Willys FC-150

Two special bodies have been approved by Willys for installation on the new "Forward Control 'Jeep' FC-150". Either a dump truck body or a service truck body may be installed on this chassis in lieu of conventional factory installed pickup or platform stake bodies. Besides the two special bodies, Willys has approved winches, snow plows, angledozers and towing equipment for use on the FC-150. The forward control design allows maximum usage of the vehicle's 81-in. wheelbase for cargo space. Cargo length is 74½ inches or, with tail gate extended, 92 inches. The dump truck body makes possible the easy dumping of sand, gravel and other cargo on job sites. The service truck body provides spacious compartments in which to store tools and equipment. These compartments face outward on both sides of the vehicle and leave the truck bed itself open for hauling large pieces of equipment or materials for use on the job. For full details write Willys Motors, Inc., Toledo 1, O., or circle **No. 8-1** on the reply card.

Wheel-Type Ditcher

Expanding their diversified line of crawler-mounted and rubber tired, vertical boom and ladder-type ditchers, Barber-Greene announces a new wheel-type ditcher. The Model 774 is a crawler mounted unit, featuring a 5-ft. 6-in. digging depth and widths, adjustable in 1-inch increments from 18 to 30 inches; use of hydraulic power transmission; a flexible connection between chassis and digging wheel; an electric, magnetically actuated overload release clutch; and a reversible, hydraulically driven spoil conveyor. Forward speeds range to 28 fpm. A dual, flexible connection permits a 10° pivot while digging. The 8-ft. spoil conveyor on the Model 774 is driven by two hydraulic motors. Its direction of belt travel is instantly reversible and its belt speed can be varied from 200 to 650 fpm. Complete information from Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill., or circle **No. 8-2** on the reply card.

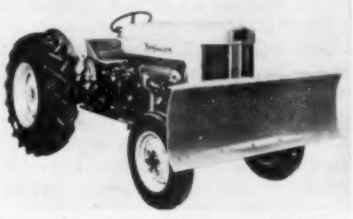
New Barber-Greene Model 774 wheel-type ditcher trenches for the placement of a 6-compartment telephone conduit

Plastic Salt Dissolvers

Fabrication of plastic salt dissolvers and brine storage tanks has been announced by the International Salt Co. Rock salt and evaporated salt dissolvers, and brine storage tanks, all made of polyester glass-reinforced plastics, can now be supplied. The plastic units completely eliminate corrosion problems and need no paint. Because they are translucent, the true salt level is visible from any position around the units. For more data write International Salt Co., Inc., Scranton, Pa., or circle **No. 8-3.**

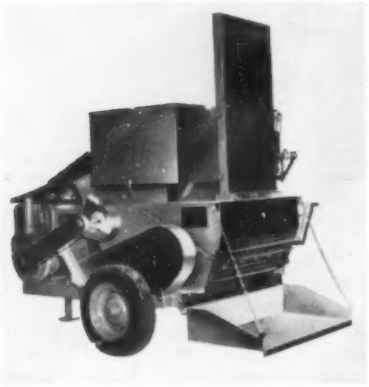
Heavy-Duty Dozer

A new heavy-duty dozer, attached to the main frame of the tractor, not the front axle, has been announced by the Earth Equipment Corp. The new Eartheo dozer is adapted to International, Ferguson, Massey-Harris-Ferguson, Massey-Harris and Ford tractors. The attachment enables the dozer blade to remain in the same plane with the rear axle of the tractor regardless of the terrain the front wheels pass over. The standard moldboard length is 72 inches and cutting blade is of ½-inch by 6-in. grader steel and is replaceable. The two hydraulic operating rams of the dozer are hard chromed pistons using the "O" ring seal principle. In "up" position for transportation the dozer has a 16-in. ground clearance. In the full "down" position it has penetration of 3 ins. For added information write Earth Equipment Corp., 2036 Sacramento Street, Los Angeles, 26, Calif., or circle **No. 8-4** on the reply card.



Dozer attached to Ferguson 40 tractor

1 3-Ton Capacity Asphalt-Patching Mixer



Mixer is used on resurfacing projects

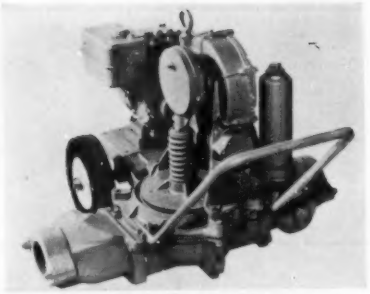
Designed for use with asphalt cements, cut-backs, emulsions, or tars, this McConnaughay HTD mixer No. 8 is available with or without a 200-gallon asphalt supply tank. Large enough for many resurfacing jobs as well as for all types of pavement patching, the No. 8 has a mixer capacity of 8 cu. ft.; the aggregate bin is marked for volumetric measuring. The unit features a low pressure burner and power-driven asphalt pump and counter. It weighs 3,800 pounds, measures 124 ins. in length, 82 ins. in width, and 114 ins. to the top of the stack with extension attached. Complete specifications from McConnaughay Mixers, Inc., Lafayette, Ind., or circle **No. 8-5** on the reply card.

Tractor and Truck Snow Plows

One-way, reversible and V type snow plows for tractors and trucks are announced by Anderson Engineering Co. The tractor mounted plows are for all wheel type units. This equipment can be used for clearing snow from sidewalks, parking areas, hangar aprons and driveways. The truck snow plows are designed for trucks of 1½ to 3 tons and can be used also on larger units. There is an automatically operating safety device that provides protection for both plow and truck from damage when hidden obstructions are encountered. These units are suitable for all types of service, and are used throughout the snow country on state highways, city streets, parkways and airports. Push frames are made of heavy section structural steel members and electric steel castings. For more information write Anderson Engineering Co., 229 Bent St., Cambridge 41, Mass., or circle **No. 8-6** on the reply card.

Hydraulic Earth Boring Machine For Guardrail Construction

A suspended-type, completely hydraulic earth boring machine which will dig holes 11 to 22 inches in diameter, up to 7 feet deep, and at any angle up to 90 degrees is now being produced by the Highway Trailer Co. It can be front or rear mounted on any type of line construction body, with any type of hydraulic derrick. When not in active use, the new unit is "self-storing" on the roof of the truck. The unit will dig in every type of soil including frost and hard pan. A drive chain crowd assembly assures rapid and smooth downward digging action. The machine has two independent hydraulic motors which rotate the auger and power the feed mechanism. Both motors are reversible. The digger unit is suspended from a derrick swivel. The swivel mounting allows complete freedom of movement, pivoting to dig holes for anchoring the pole. For further details write to Highway Trailer Co., Edgerton, Wisc., or circle **No. 8-7** on the reply card.



Rice Diaphragm Pump

A new line of lightweight diaphragm pumps are announced by Rice which are completely new in diaphragm pump design. Speed reduction from engine to pump is accomplished in one step by means of a worm gear drive. This eliminates intermediate speed reducers on engines and motors. The new line is available with suction accumulators and swing type valves or with ball check valves and may be obtained with any standard engine or electric motor, or without power if desired. For complete details write Rice Pump & Machine Co., Belgium, Wisc., or circle **No. 8-8** on the reply card.

Pickup Truck Digs Holes and Lays Pipe

A pickup truck can dig holes and lay pipe by the addition of two pieces of equipment introduced by H. S. Watson Co. The Watson Robin digger works from a power take-off flexible shaft coming out at the rear end under the truck body. Holes up to 40 ins. deep and 10½ ins. in diameter can be dug. Fencing, posts and other building materials are carried in the truck, enabling the driver to build as he goes. The Watson crane is mounted in a detachable socket well in the body floor at the rear of the pickup. The crane has 500, 1000, or 2000-lb. capacities with a 360° swing, and up to 32-ins. reach. This is excellent for laying pipe (concrete, cast iron, corrugated, etc.) in trenches. For full details write H. S. Watson Co., 1316—57th Street, Emeryville 8, Calif., or circle **No. 8-9** on the reply card.

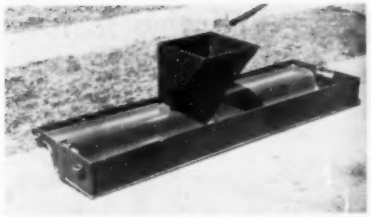
Guardrail posts are carried in the truck enabling the driver to build as he goes

Variable Flow Rate Pump-Motor Set

A variable flow rate pump-motor set designed specifically for pilot plant, laboratory or process work where controlled and varying rates of flow of corrosive fluids and abrasive slurries are required is now available from Vanton Pump & Equipment Corp. Several means of obtaining variable speeds are provided. One is a hand operated variable pitch pulley arrangement. Another is an integral variable speed motor drive in which provision is made for automatic process control by using an air cylinder to set the rpm of the variable speed drive. An air signal, operating at an instrument pressure of 3-15 psi, is the sensing and controlling portion of the system. The signal pressure controls the power air through an amplifier, thus controlling the rpm of the pump drive. Proportional flow, constant liquid level, and other process variable control problems lend themselves to ready solution with this type of pump-motor system. The pumps are self priming and flow rates from fractional to 40 gpm are available. For full information write to Vanton Pump & Equipment Corp., Hillside, N. J., or circle **No. 8-10** on the reply card.

Angle Dozer Attachment

A new angle dozer attachment for the Davis Loader is announced by Midwestern Industries. With this attachment the operator can back fill by "shaving in" the dirt while running parallel to the ditch. The new Davis angle dozer attachment has a unique angling device as well as three offset adjustments. By pulling two pins, the attachment can be offset seven inches to either side of center. The tilt and "bite" of the blade is hydraulically controlled. The attachment is excellent for back filling; moving snow from parking lots; and, because of the angular tilt control, for cutting and cleaning ditches. Write Massey-Harris-Ferguson, Inc., Industrial Div., Wichita, Kans. or circle **No. 8-11.**



Forms for concrete curbs and gutters

"Curb Mule" For Building Curbs and Gutters

A "Curb Mule" that eliminates entirely the need of curb face forms in pouring concrete for curbs and gutters has been introduced by Midwest Metal Stamping. The sliding form makes possible continuous pouring of integral curb on slab or curb and gutter. Of all-steel construction, the form is 86-ins. long and 27-ins. wide. Adjusting bolts on the cross ribs permit changing the angle of the face sheet to conform with the variation that might occur where the crown of slab meets the curb line. An angle running lengthwise at the back provides for the proper guiding of the sliding form on the 6-in. curb back form. The forms may be ordered to conform to any special profile. For full data write Midwest Metal Stamping Co., Kellogg, Ia., or circle **No. 8-12** on the reply card.

Dust Particle Measurements

A new principle applied for measurement of dust particles in the 1-100 micron size range involves the forced passage of a fluid suspension of particles through a small aperture having an electrode on each side. The aperture resistance changes in proportion to particle size, and the resultant series of electrical pulses is electronically scaled and counted. In apparatus now available (the Coulter Counter, Model A), curves of cumulative particle frequency vs. particle size are obtained directly. Apertures from 35 to 400 microns count particles ranging from 0.7 to 200 microns, and a range of 20 to 1 in particle size is readily obtained with a single aperture. Corrected counts provide data of 0.5 percent overall accuracy or better and the fatigue element of visual microscope counts is eliminated. In a single count, 0.5 cc passes through a 100 micron aperture, requiring 10 to 15 seconds. A ten-point particle content and size distribution determination requires 5 to 10 minutes. For further details write Coulter Industrial Sales Co., P. O. Box 22, Elmhurst, Ill. or circle **No. 8-13** on the reply card.

"Speedcat" Tractor—Bulldozer

Mead Specialties Co. announces a new Model R-9 "Speedcat" tractor and bulldozer that is completely new. It introduces a number of innovations into the midget tractor field, such as the in-line transmission with all gear trains and steering enclosed in one case, running in oil on either ball or needle bearings, completely enclosed sealing out dirt, dust and water. The transmission has three speeds forward and one reverse, and these are multiplied by the mechanical type of "power steering", which has a dual range and neutral position. Without attachments, it is 36 ins. wide, 62-ins. long and weighs 1150 pounds; yet its 1300-pound draw bar pull will handle many jobs. The tractor is powered by a Briggs and Stratton 23FB motor rated between 8-9 hp. For further information write Mead Specialties Co., Dept. SC-2, 4114 North Knox Avenue, Chicago 41, Ill., or circle **No. 8-14** on the reply card.

Steam Cleaner For Maintenance Departments

A compact new steam cleaner has just been announced by the Clayton Mfg. Co. The Clayton-Kerrick 60 "Handyman" steam cleaner has a 60-gallon capacity and is handy for light duty general utility cleaning. The "60" is a complete self-contained unit operating on any water pressure and requiring no auxiliary pump. The right pressure, the right temperature and moisture of the cleaning solution, the right soap content — these are combined in Clayton-Kerrick cleaners in a carefully engineered balance. Full details from Clayton Mfg. Co., P. O. Box 550, El Monte, Calif. or circle **No. 8-15** on the reply card.

Hi-Ranger With Hydraulic Saw & Pruning Tool

All-hydraulic Hi-Ranger Model 4-40CH may be installed on most trucks.

An extensible personnel platform by Mobile Aerial Towers is now being offered complete with hydraulic chain saws and pruning tools where users require these power accessories. Designed specifically for medium height municipal maintenance work, the Hi-Ranger Model 4-40CH may be mounted on most commercial vehicles, depending upon user requirements and specifications. The unit is all-hydraulically actuated and controlled, deriving operating pressures from the carrying vehicle's engine. Snap-on type hydraulic fittings for operation of accessory tools are standard. One set is usually mounted on the operator's basket for elevated work points; and a second set is incorporated near the base for convenient ground level tool connection. Maximum work-level elevation of the unit is about 46 feet; the operator, in the completely insulated personnel basket, uses a single "3-D" control to reach quickly almost any point in a 40-ft. radius. Additional details from Mobile Aerial Towers, Inc., 1747 N. Harrison St., Fort Wayne, Ind., or circle **No. 8-17** on the reply card.

Low-Cost Vibratory Compactor

Vibro-Plus Products, Inc. announces their new Terrapac Model CK 10 vibratory soil compactor as a companion to the Model CH 30 and CM 20. Weighing only 1½ tons, it produces a five-ton impact due to a combination of vibratory frequency (2400 VPM) and high amplitude. Lower vibration frequencies mean less wear and tear on the unit, sharply reducing maintenance problems—downtime is said to be virtually eliminated. The CK 10 is highly maneuverable; it may be towed by the smallest rubber-tired tractor to within 1½ ins. of walls, abutments, etc. For more complete information write Vibro-Plus Products, Inc., Stanhope, N. J., or circle **No. 8-16** on the reply card.

Truck Mounted Water Sprinkler

Complete information on 2 types of water sprinklers is now available from Littleford Bros. Truck and trailer mounted units with gravity feed are equipped with spray bars 8-ft. in length and 2 inches in diameter. Pressure type spray bars are available if desired. Gravity feed units range in size from 800 to 1500 gallons. A pressure type, truck mounted water sprinkler can be equipped with a spray bar from 8-ft. to 24-ft. in length. Pump size is 2 or 3 inches in diameter depending on the length of spray bar used. Sizes for the pressure type, truck mounted sprinkler range from 800 to 1500 gallons. For more data write Littleford Bros., Inc., 457 E. Pearl St., Cincinnati 2, Ohio, or circle **No. 8-18** on the reply card.

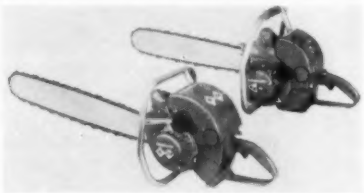
Gravity feed and pressure type water sprinklers are provided by Littleford

New Line of Bituminous Distributors

The 1250-gallon Aeroil bituminous distributor applies heavy material through spray bars up to 24 feet long. Due to circulating 250 or more gallons per minute through the spray bar, the spray bar heats faster. The circulation system provides direct feed to nozzles all along the spray bar for balanced pressure. The spray bar, as well as the piping system and pump, can be drained quickly, with material going back into the tank, and the system can be flushed out. For further details write Aeroil Products Co., Inc., South Hackensack, N. J., or circle **No. 8-19** on the reply card.

Homelite Chain Saws

Two new chain saws, Model 6-22 and EZ-6 have been announced by Homelite. Called the "Power Twins," both saws have a 6 hp engine—the EZ-6 is a direct-drive, 19-pound unit; the 6-22 is a gear-drive, 22-pound unit. The EZ-6 will cut through 8-in. oak in 4 seconds and 18-in. pine in 12 seconds; and bring down trees up to 5 feet in diameter.



Chain saws are available for clearing right-of-way and roadside maintenance

It is easy to handle on any cutting job whether on harvesting woodlots, pruning trees, cutting fence posts, hedgerow or cordwood. The new gear-drive 6-22 is built for hard use. It can bring down trees up to 7 feet in diameter and can cut through 20-in. trees in 18 seconds. For further information, write Homelite, Port Chester, New York, or circle **No. 8-20** on the reply card.

No lifting required with this system

Bulk Refuse Collection System

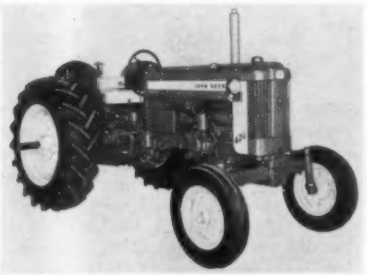
A new bulk refuse collection system that is practical for municipalities as well as for private collection of commercial and industrial refuse is announced by City Tank Corp. The Roto-Can holds a full cubic yard and is mounted on four roller-bearing wheels that rotate 360°. This can handles easily and the hydraulic lift raises the unit and empties it into the Roto-Pac hopper. One man can easily perform this operation. For further details write City Tank Corp., 53-09 97th Place, Corona, L. I., N. Y., or circle **No. 8-21** on the reply card.

Contractors Pump

A self-priming portable contractors pump has been announced by Lancaster Pump. The new pump features a four volute cut-off design which yields extra high capacities in the high pressure range without overloading the 2 hp 4-cycle gas-engine. Grease lubricated seal, built-in check valve, steel base, carrying handle and strainer are included in the unit. For more information write Lancaster Pump & Mfg. Co., Inc., Lancaster, Pa., or circle **No. 8-22** on the reply card.

Deere Utility Tractor

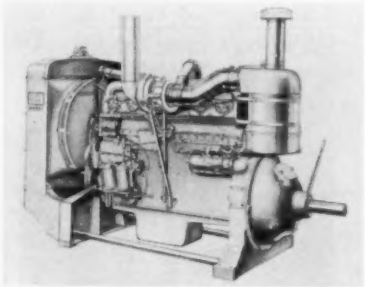
A wheel-type utility tractor, with power steering optional, is announced by John Deere. The new tractor is called the "420" Special Utility. It handles a wide variety of front-end and rear-mounted working equipment, including backhoes, loaders and trenchers. The unit delivers approximately 30 hp and is designed for extra stability under load. Regular equipment includes adjustable rear wheels and Dual Touch-o-Matic hydraulic control. Front wheel tread is fixed at 52 inches, center to center of tires. For further details write John Deere Industrial Div., Moline, Ill., or circle **No. 8-23** on the reply card.



Wheel-type utility tractor has a 3-point hitch, delivers 30 horsepower

250-HP Turbocharged Power Unit

A 250-hp Turbotorque UDT-1091 power unit has been announced by International Harvester Co. The horsepower rating is attained at 1,500 rpm. The 6-cylinder unit has a water-cooled oil temperature stabilizer as standard equipment. For full details write Consumer Relations Dept., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., or circle **No. 8-24** on the reply card.



International power unit has continuous duty rating of 200 hp, developed at 1,500 rpm for economical operation

Remote Recorder For Your Present Water Meter

A simple practical instrument which allows the exact remote reading of your existing inside meter is announced by the Remote Recorder Co. The unit is easy to install and operates up to 200 ft. from the water meter. There are no moving parts except at the meter head and the magnetic counter. It has an easy-to-read numerical recorder and is housed in a bronze casting. For further details write Remote Recorder Co., 2012 Lowell St., Saginaw, Mich., or circle **No. 8-25** on the reply card.

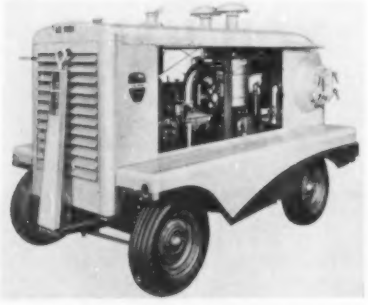
Agricat Loader With Hydraulic Bucket Tilt

Loader made for crawler-type tractors

A new Agricat loader equipped with a hydraulically operated bucket tilt mechanism has been developed by Joost Mfg. Co. Designated the Model F, the machine may be quickly converted from a loader into a light earthmover simply by replacing the bucket with a blade attachment. The changeover takes less than 10 minutes. For loading operations, the hydraulic bucket tilt mechanism permits fully controllable spillage, and may even be used for breaking and loosening hard-packed soil after the bucket ripper teeth have penetrated. It can load to a maximum height of 87 ins. from a depth of 5 ins. below track level. For more details write to Joost Mfg. Co.. 742 Bancroft Way, Berkeley 10, Calif., or circle **No. 8-26** on the reply card.

Lightweight, Short-Turning Rotary Air Compressor Offered by Le Roi

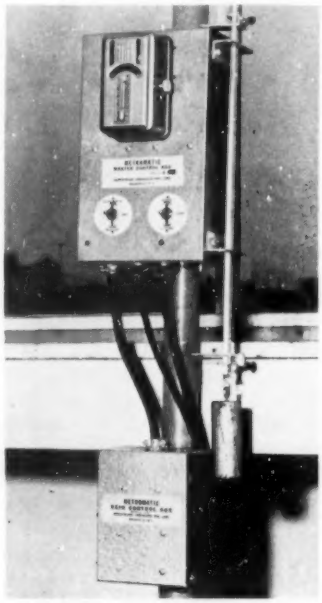
A light, short-turning 600 cfm rotary air compressor has been announced by Le Roi Division, Westinghouse Air Brake Co. It is a portable, two-stage, sliding vane type rotary air compressor and has a dry weight of 7730 lbs. and a turning radius of 11 ft. 11 in. The compressor is coupled to a GM-71 diesel engine with a hydraulically activated clutch. Two 41-gallon fuel tanks, one on each side of the compressor and under the fenders, provide equal weight distribution and a low center of gravity. A side-by-side arrangement of individually cast cylinders provides compactness, ease of inspection, and accessibility. The unit allows easy vane inspection, quick service and maintenance in the field, and less expensive component parts. For more detailed information write the Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, or circle **No. 8-27** on the reply card.



Air compressor can be used on highway construction and maintenance projects

Automatic Ventilating Units for Sludge Beds

Automatic roof ventilating units for sludge drying beds have been announced by Metropolitan Greenhouse. The unit is called Metromatic and is a simple, but amply powered device, that adjusts to any new or existing handwheel. Depending upon the temperature, the roof sash is either opened or lowered automatically. A thermostatic control determines this. As little as 5° is enough of a change to set Metromatic into action. A new rain control device attached to the ventilating apparatus automatically closes the roof sash at the first drop of rain—while the outswinging, deflecting side sash prevents rain from entering at that point. Once the rain stops, the thermostat takes over and opens the roof sash to achieve desired temperature. For additional data write Metropolitan Greenhouse Mfg. Co., Brooklyn, N. Y., or circle **No. 8-28** on the reply card.



Temperature and rain control device for sludge drying beds

Portable 2-Way Radio

The Industrial Pak-Tone portable 2-way radio is a communications unit that is powered by self-contained batteries and may be operated anywhere with complete dependability. The two basic Pak-Tones are the type PS40 for the 25 to 55 Mc band, and the PS150 for the 145 to 174 Mc band. Batteries, microphone and antenna are included and an all weather canvas carrying case to provide extra protection for outdoor use is available. For detailed specifications write Industrial Radio Corp., 428 North Parkside Ave., Chicago 44, Ill., or circle **No. 8-29** on the reply card.

NEWS OF ENGINEERS

HERBERT C. CLARE, Sanitary Engineer in Charge, Pacific Northwest Office, United States Public Health Service, has been elected Chairman of the Columbia Basin Inter Agency Committee, succeeding Brigadier General L. H. Foote, Division Engineer, Corps of Engineers, Portland, Oregon, as Chairman.

J. H. SVORE, Senior Sanitary Engineer USPHS, of Bismarck, N.D., has been called to active duty in connection with Columbia Basin Inter Agency Committee activities. Mr. Svore will be on duty in the Pacific Northwest Office of the Public Health Service in Portland under the direction of Herbert C. Clare, Sanitary Engineer in Charge.

W. H. CORDDRY was elected President of Gannett, Fleming, Corddry & Carpenter, Inc., succeeding Farley Gannett who became Chairman of the Board of Directors. S. W. FLEMING, JR. was named Vice-Chairman of the Board and Treasurer; and J. D. Carpenter, Senior Vice President and Secretary. An associated partnership to handle various consulting engineering was also formed, the partners being W. H. Corddry, J. D. Carpenter, J. R. Dietz and R. W. Foster.

THE HEYWARD - ROBINSON COMPANY, architects - engineers, specializing in construction, as well as plant and building design, have located at 114 Liberty St., New York.

A Division of HYDRAULICS and SANITARY ENGINEERING has been formed by the Philadelphia Section of the ASCE. A temporary executive and program committee has been elected consisting of Walter A. Lyon, Chairman; Romeo Falciani, Vice - Chairman; and William T. Savage, Secretary. The Division will meet quarterly at the Engineers Club, 1317 Spruce Street, Philadelphia, Pa. Field trips are planned in addition to the regular meetings.

W. C. LAUGHLIN, well-known sanitary engineer, died recently in Clearwater, Fla. Mr. Laughlin was perhaps best known for the invention of equipment for the rapid filtration of sewage and similar wastes. He retired some years ago.

PROFESSIONAL OPPORTUNITIES

Sales Representative Wishes Accounts

An experienced salesman with technical background will handle water, sanitation, refuse and public works products for municipalities and industries in the area: New Jersey, Eastern Pennsylvania, Southeast New York State and Southern New England. He resides in northern New Jersey. Write Box 8L, % Public Works, 200 South Broad St., Ridgewood, N. J.

Sanitary and Industrial Hygiene Engineers Needed by Air Force

Sanitary and Industrial Hygiene Engineers will be needed by the Air Force during the Fiscal Year 1958. Minimum qualifications are a Degree in Sanitary, Civil, Chemical or Industrial Hygiene Engineering and age not over 34 at time of appointment. Appointment will be in the grade of Second or First Lieutenant. Qualified First and Second Lieutenants of Air Force Reserve components, not on extended active duty and under 34 may also apply. For details write to the Chief, Liaison and Selection Division, Directorate of Staffing and Education, Office of the Surgeon General, USAF, Washington 25, D. C.

CLASSIFIED ADVERTISING AND JOB OPPORTUNITIES

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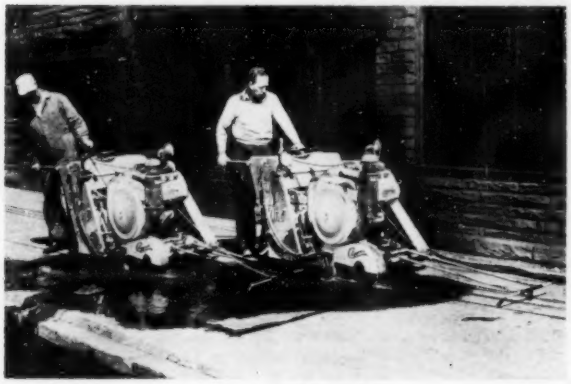
Worth Seeing

The City of New York will make molehills out of mountains (of refuse) when the 300 new Roto-Pac collection units of which this is one are on the job. City Tank Corporation received this largest single order ever for such units by one city.



The old-style stage magician who sawed a beautiful young woman in two had nothing on these two Model C-360 Clipper concrete saws that are literally cutting a city (St. Louis) in two. Approximately 20 miles of trenches for underground lighting cables will be sawed this way.

More than 25,000 feet of high-impact rigid polyvinyl chloride pipe, made from B. F. Goodrich Chemical Company's Geon resin, is going into the underground sprinkling system of the City of San Antonio, Texas', Park and Recreation Department. Pipe is 1½-inch in 20-foot lengths.

Keeping a beach clean is big-scale housekeeping. Golden Beach, Fla., with an exclusive residential district of $40,000 to $250,000 homes quite near the water does it with this J. I. Case Co. Terra-Trac tractor equipped with a farm-type side-delivery rake. Even the Town Manager and Chief of Police run it—for fun, but in the interest of civic pride, too.

by Arthur K. Akers

★ GEORGE W. KELSEY, vice-president of B-I-F Industries, Inc., recently served with distinction as general chairman of the National Resources Conference at Providence.

Mr. Kelsey

Mr. Affleck

★ J. CALVIN AFFLECK goes from Allen B. DuMont Laboratories to advertising manager of Keasbey & Mattison Co., Ambler, Pa., succeeding Walter C. Dodge, retired.

★ MASSEY-HARRIS-FERGUSON will start immediately a 100 percent remodeling and expansion program at their Detroit plant. This means a single shift production of 250 tractors per day.

★ NEW MANAGEMENT of Cloroben Chemical Corp., South Kearny, N. J. (odor control) is headed by Abraham Wiener, president; H. Everett Smith, vice-president and general manager; and Arnold H. Haverlee, technical director and head of field work.

★ W. H. SANDERSON, Thomas R. Komline and members of the sales and engineering departments of Komline-Sanderson Engineering Co., photographed at ceremonies marking the start of their new office building, Peapack, N. J., are pictured below.

★ RICHARD V. FORD, vice president of the Ford Meter Box Co., heads the new Water and Sewage Works Manufacturers Association administration as president. Other officers are, Edward E. Alt of Chicago Bridge and Iron Co., vice-president; Reginald F. Hayes of Hydraulic Development Corp., treasurer. Continued smooth running of the Association is assured by the renaming of John G. Stewart as manager and Dorothy Dimmers, secretary.

★ PEERLESS PUMP DIVISION, Los Angeles and Indianapolis, appoints Everett W. Lundy general sales manager.

★ ANTHONY ANABLE rejoins Dorr-Oliver actively as manager of the Technical Data Division.

★ FISCHER & PORTER CO. news includes promotion of Robert L. Rice to general sales manager, and the moving of its New York metropolitan office to 141 Main Ave., Clifton, N. J.

★ SOILTEST, Inc., Chicago, whose name means just that, opens a new Eastern office under Thomas J. McNeil at 60 East 42nd St., New York.

★ WILLIAM H. COCHRANE has been elected executive vice-president Neptune Meter Co., New York, to coordinate the parent company and its numerous subsidiaries. Cox and Stevens are among these.

★ ULCERS are usually the result of mountain climbing over mole hills.
—*Wall Street Journal*

Dallas Memorial Auditorium
Archt.-Engr.: George L. Dahl, Dallas
Cons. Engr.: Amman & Whitney, New York City
Gen. Contr.: R. P. Farnsworth & Co., New Orleans-Dallas

how architects employed POZZOLITH to get desired concrete results

ARCHITECTS and ENGINEERS employ POZZOLITH with confidence

★ *proved performance*...130 million cubic yards of concrete produced with Pozzolith for all types of jobs.

★ *applied know-how*...more than 85 skilled Master Builders' field technical men for product-use consultation.

★ *available everywhere*...over 1000 ready-mix and job-site plants now producing concrete with Pozzolith.

Concrete with lowest possible unit water content and good workability was specified in the construction of this $8,000,000 Dallas Memorial Auditorium.

A prime requirement was control of rate of hardening under summer and winter job conditions to provide uniform workability and uniformly high 48-hour strength for the lightweight concrete of the dome.

These requirements were met with Pozzolith. Pozzolith with its adaptations is key to the control of:

1. *water content*...makes possible lowest unit water content for a given workability.
2. *entrained air*...provides optimum air content without sacrificing other desired qualities.
3. *rate of hardening*...gives desired handling and finishing time under widely varying job conditions.

Ask us to demonstrate the full advantages of Pozzolith for *your* project.

COLORED MOTION PICTURE, "The Man with The Trowel", shows how Pozzolith greatly improves your control of concrete quality. Film available for private showing to groups of any size.

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W&T *Quality-Quantity Chlorinator*

Select the residual you want and the new W&T Quality-Quantity Chlorinator will automatically maintain that residual. Immediate sensing of any change in a water's chlorine demand—as well as flow—automatically controls chlorine feed rate to maintain a desired residual. That is Dosage Automation with the new W&T Quality-Quantity V-notch Chlorinator.

DOSAGE AUTOMATION OFFERS THESE FEATURES:

Maintains

a selected residual, free or total, with automatic dosage control.

Anticipates

changes in chlorine demand.

Controls

Chlorine feed up to a full 100 to 1 range at rates to 2000 pounds of chlorine per 24 hours.

Provides

a record of chlorine dosages in p.p.m. and chlorine feed rates in pounds per 24 hours.

Utilizes

the proven W&T V-notch Variable-Orifice for accurate, wide range chlorine feed.

For more information about this new type of chlorination system write for Bulletin S-116.

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